AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 8., No. 40. WEEKLY. | NEW YORK, OCTOBER 3, 1885. | $2.50 per Annum. SINGLE COPIES, 5 CENTS.

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New Machines for Machinists and Metal-Workers.

The engravings on this page represent two machines made by E. Gould & Eberhardt, Newark, N. J.

The tool grinder is designed to meet the demand for a simple, compact and durable tool of this class. It takes up but half the room of an ordinary grindstone, and performs its work with the well-known rapidity of an emery wheel. Water is supplied to the wheel by a pump, and so liberally as to avoid any danger of heating the tool being ground. By the method employed in supplying water, it does not splash or wet the floor.

The wheel used with these machines is 18″ diameter, 3″ face. Tight and loose pulleys, 10″ diameter, 3″ face.

The automatic dial press is a strongly-constructed machine, entirely automatic in its operation, so as to be operated by an unskilled workman without danger of breakdowns. Its capacity is from 400 to 600 gross of small work per day, without fatiguing the operator.

A safety attachment prevents the possibility of the punch coming down and striking the revolving plate, should a mistake be made by the operator. The crank-shafts are of hammered steel; sliding surfaces scraped to fit. Means for taking up wear are provided. Pressing the treadle with the foot, then releasing it, stops the punch up.

For setting the punch there is a simple adjustment, so that the crank can be turned by hand without throwing off the belt. This machine is made with special reference to doing a large variety of work.

While passing through a large railroad yard not long since, we could not but think of the desolate appearance the place had, with its piles of cinders, foundry flasks, its scrap heaps, and dusty roads and tracks. Is a man worth as much to the world, we asked ourself, to pass one-third of his life among such surroundings? Just then we turned a corner and came upon a bit of ground not 20 feet long, which was surrounded with nice edge stones, a fringe of green grass, and completely filled with foliage plants and bright-colored flowers.

Apparently there is not much poetry eropping out of a greasy machinist, but we do not believe there was a man in that yard but appreciated that bit of green, and felt like a better man every time be looked at it.

Some peculiar treatment to which rice is supposed to be subjected to in Holland is the subject of anxious inquiry in this country, but the process is jealously guarded. We believe the "secret" would be just as valuable as the discovery of how wooden nutmegs are made in Connecticut.

We notice that an effort is being made to secure standard sizes in stove pipes. If some one will tell a fellow how to make the large end of one piece of pipe fit into the small end of another piece, he will cover the whole ground.

In an automatic-feed ratchet or brace-drill exhibited at the Inventions' Exhibition, England, the drill is moved in the right direction for cutting by both the forward and backward motion of the lever or handle.

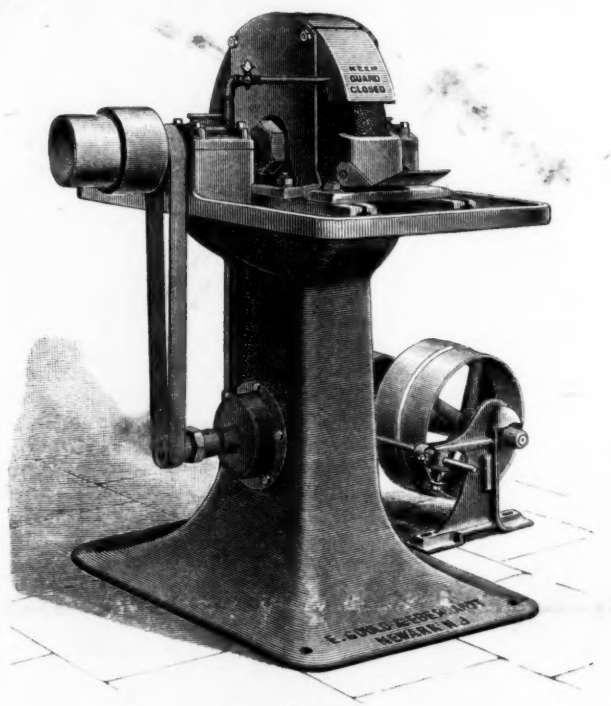
Observation in a Machine Shop.

BY TANGENT.

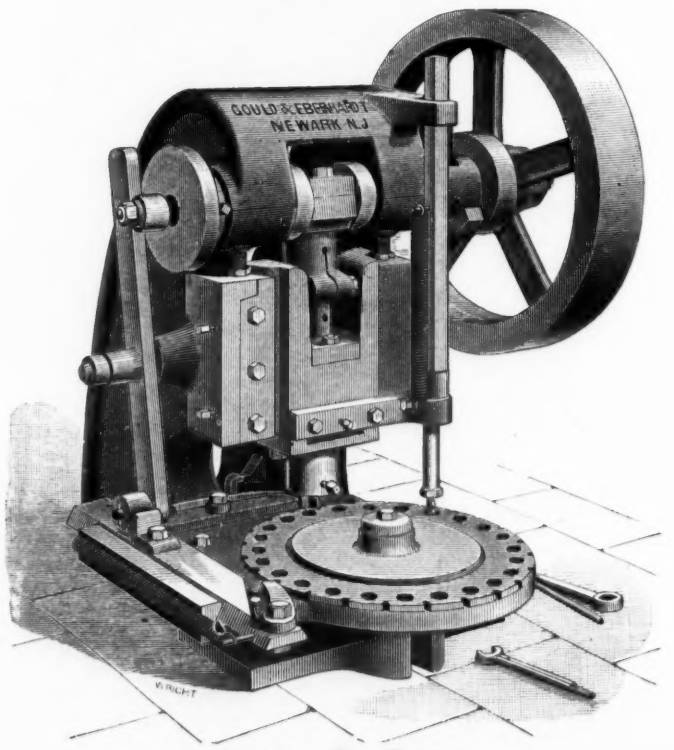
The life of a shop foreman is not always a bed of roses. I have been one for many years, and, to be frank, I like it much better than jour work. I would hate awfully to get down to hard work again—yet there are many very unpleasant things that we have to meet. The very nature of the life calls for this; if everything went smooth, if there were no mistakes to rectify, no crooked places to straighten, no snarls to untangle, nothing to decide upon evidence so scanty Solomon of old would be perplexed, no one upon whom to lay the blame when things go wrong in the office and the comment is "some more of Smith's smartness: that man gets dumber every day;" when things go wrong in the shop, and the boy who has managed to smash up something,—after looking over the situation and wondering whether he had better quit or go and hang himself, suddenly recollects that he said something about this same thing perhaps a month before, pulls himself together and swaggers down the shop saying, "just as I expected, I told the old man how it would be," etc., etc.; no one to find fault with on the road when pins get hot, or boiler gets cool; if it were not for these difficulties there would not be any need of *us*.

Of course it is not all bad. We have some good times. Our vanity often gets tickled—somebody who has an axe to grind, or thinks that he may have one some time, tells you what a wonderfully smart man you are, and you take it all in and enjoy it, although you know that it is the thickest kind of taffy in the market. Then we can lose a day once in a while and we don't feel that our pay is going to be reduced thereby. If we work for a railroad company, we can get passes a little easier than the men, or most of them; then there are the perquisites; if you are working for a firm doing a general repair business you go out into the country to make an estimate at a saw mill or a tannery, and the proprietor takes good care of you, gives you a big dinner, sets up the cider and soda water, and explains to you what a brilliant man you are.

I had a turkey given to me one time. Then there are the agents, when they come around they smooth out the ridgey places—God bless the agents—these and lots of things of that order make us feel that life is worth living. Perhaps I have written these lines in a spirit of levity, but indeed they call up part of the average foreman's life, and were they taken out, you would take away much of the brightness—I mean the good times, of course. You may take away the jawing and all that kind of thing as much as you please, and we won't find any fault. At the same time I honestly believe that they are the very things that are the making of us. If we deserve them, they will make us do better, and if we don't deserve them they will toughen our hide. The thin-skinned man has no business in a machine shop any way.



TOOL GRINDER.



AUTOMATIC DIAL PRESS.

The Novelties Exhibition at Philadelphia.

"Looks like a big shop, about half finished," we heard a gentleman say as we entered the exhibition building and found the promenades filled with mule-teams, lumber piles, un-erected machinery, crowds of mechanics, and unsightly stagings.

We had dared to hope that the exhibition would be true to its name, and present the novelty of being "on time," but no—it was just like every other exhibition, not ready.

Somebody seems to be deserving of severe criticism, for not being ready. Considering the present state of business throughout the country, the exhibitors have no excuse for not being ready. The management is also behind in the piping of several engines, but they in turn, are handicapped by certain boiler owners.

At 12 o'clock, Judge Kelly, of Philadelphia, delivered some very interesting and pointed remarks, during which he alluded to the good work done by the Centennial exhibit, and which has been continued by the Franklin Institute.

The speaker reminded the wealthy men of the good use the institute could make of increased funds, and called upon executors to remind their clients of the fact when making wills.

He also facetiously reminded his wealthy hearers that they had better leave their money with the Franklin Institute, "rather than try to take it with them, and run the risk of its melting!"

At exactly 1 o'clock P. M., Judge Kelly declared the exhibition opened, the electric bells of each engine gave the signal, and one Colt's disk-engine, two Buckeye and one Wetherell-Corliss engines were put in mo-

tion. A Chambers brick machine, the William Johnson angular shaft-coupling exhibit, and Wilbraham Brothers' rotary pump were on the roll of honor as being started up when the exhibition opened.

A countershaft with patent loose pulley attachment, by Philadelphia Shafting Works, also started, being driven by the Colt disk-engine. One of Burnham's automatic engines was all ready to start, but the dynamo-machine which it is to drive had not been connected by the electricians.

It is ridiculous, that with two months' time, and no pressing business, exhibitors cannot be on hand.

A water-gas plant by the Lowe Manufacturing Company is practically ready to start, and as others get ready we will tell about them. We are somewhat in doubt about one engine, however, they are just excavating for its foundation. It may be ready next year.

There are hundreds of exhibits which promise to be of the greatest interest to all.

The Manufacture of Steel Castings.

Abstract of a paper read before the Chattanooga meeting of the American Institute of Mining Engineers by P. G. Salom.

The two principal difficulties that the steel foundryman has to contend with are blow-holes and shrinkage. It is commonly supposed that blow-holes in castings are due to carbonic acid gas, disengaged during the operation of casting. This is only true to a very limited extent, especially where the steel contains 0.1 per cent. or more of silicon. Herein lies the cause of the many failures connected with the manufacture of steel castings. The manufacturers had been led to believe that it was only necessary to add a few pounds of ferrosilicon to their steel, and presto! all the castings would be solid. Practical experience has proved the fallacy of this idea.

Blow-holes in steel which has been properly melted, and to which has been added sufficient ferrosilicon, are almost entirely due to the high melting point of low carbon steel, or rather to the rapidity with which the metal chills. This is proved by the fact that the lower ends of castings which have been fed from the bottom by means of a runner are always solid, while the blow-holes, when such exist, are always on top. Out of the thousands of castings we have made, I have never yet seen a single one with blow-holes where the gate joined the casting. The metal does not remain fluid long enough to allow the air and other gases, that are mechanically carried into the mould, to escape.

The second serious trouble encountered by the steel foundryman is shrinkage. This presents a difficult and troublesome problem, which has not as yet been fully solved. It is almost impossible to make certain large, thin, complicated castings of steel. Shrinkage troubles are caused by the immense contraction of cast steel, which frequently amounts to $\frac{5}{16}$ inch per foot, and to the hard dry sand moulds, which it is necessary to use, in order to prevent the white-hot metal from destroying the mould.

There are five differeut ways of attempting to remedy this evil:

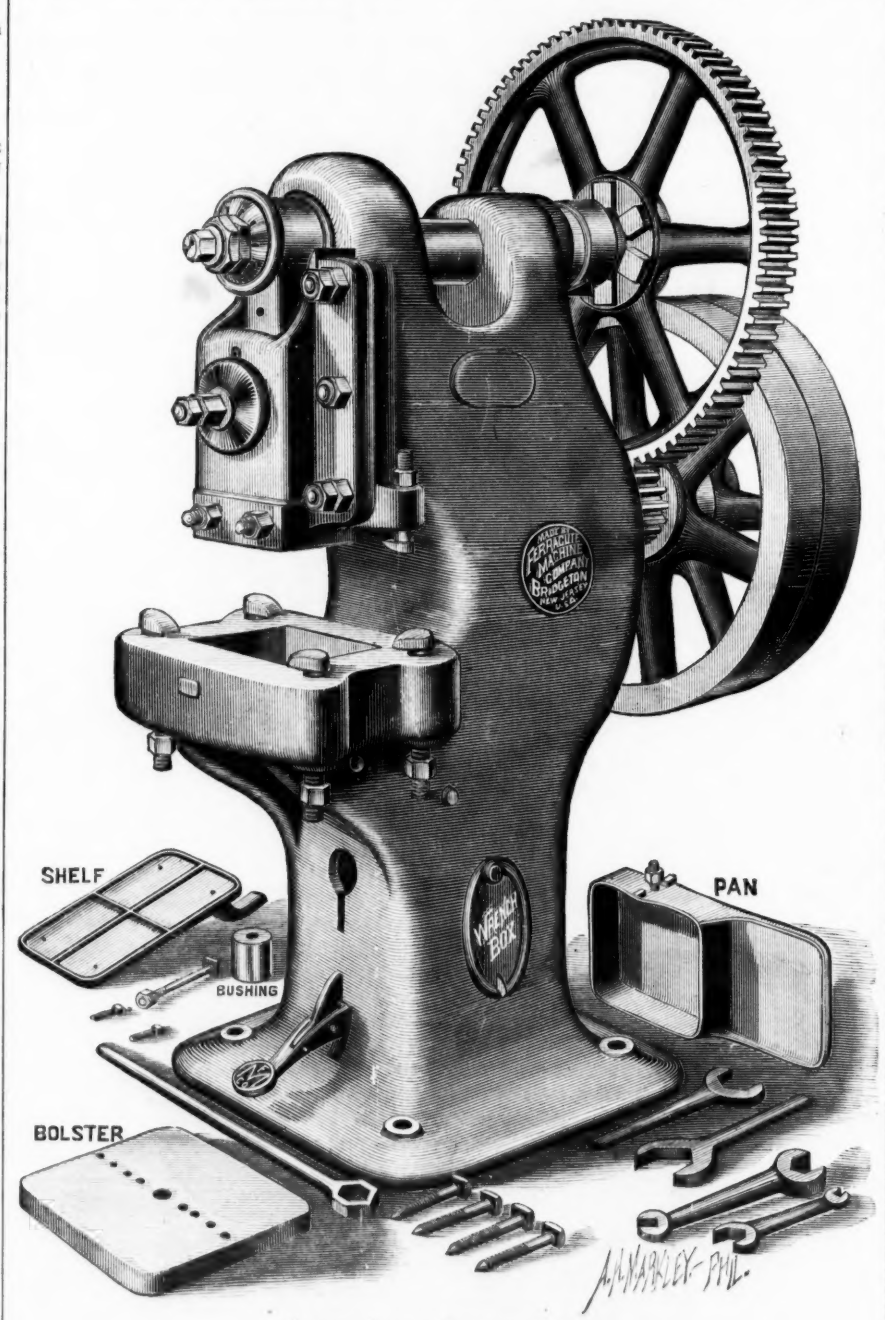
1. By changing the chemical constitution of the steel.
2. By stripping the castings as soon as poured.
3. By mechanical pressure.
4. By large rising heads.
5. By care in moulding.

A change in the chemical constitution, by increasing the manganese and diminishing the silicon, will nearly always have the desired effect. This renders the metal more fluid, and lowers its melting point. A large number of castings can be saved from tearing apart, or cracking when cooling, by simply opening the flasks immediately after pouring and covering the casting with sand. We have been able to save quite a number of difficult castings by means of mechanical pressure.

Many castings can be saved from shrinkage cracks by an intelligent moulder. It would be useless for me to enter into details on this subject. Suffice it to say that every pattern is a study; and it is only by an intelligent application of the knowledge already gained that it is possible now to make castings that a few months ago it would have seemed ridiculous to attempt.

The influence of carbon on steel is better known than that of any other substance which enters into its composition. No one, however, so far as I am aware, has done anything more than formulate the general law that tensile strength increases with the carbon, other things being equal. I have made the interesting observation that this increase is almost exactly 1,000 pounds for every 0.01 per cent. of carbon. That is to say, assuming 0.01 per cent. of carbon to be a unit of carbon, then if to 45,000 pounds (the tensile strength of pure wrought iron) we add as many thousand pounds as there are units of carbon, we shall be able to make a very close approximation to the tensile strength.

Manganese plays an exceedingly important and valuable part in the manufacture of steel casting. Low carbon steel, to which has been added about 0.3 per cent. of silicon, is very pasty, and can be poured, without chilling, into the largest castings only. Manganese will correct this trouble to a great extent, although somewhat at the expense of softness and ductility. The castings, however, as we have seen above, are more apt to be solid and less liable to crack in the moulds, the metal being much less red-short.



Geared Power Punching Press.

Geared Power Punching Press.

In our issue of April 25, 1885, we illustrated and very fully described a new power punching press, made by the Ferracute Machine Company, Bridgeton, N. J. The illustration presented herewith represents this press as made for heavier work. For the balance wheel a large spur gear is substituted, and an extra shaft provided at the back, fitted with a pinion, fly-wheel and loose pulley.

The slower and correspondingly stronger motion of the slide-bar thus brought about, adapts the press for heavier work, such as punching thick bar iron or steel, cutting-off flat and round bars, &c. They are accordingly better suited for use in machine and boiler shops, by car and bridge builders, in iron and steel works, in fact for all classes of work requiring stronger motion than can be had with the press arranged as in our previous description.

Chalk in the Shop.

When you want to take off distances on a stick with pencil and try-square, and the stick is dirty and black, don't spend fifteen minutes in hunting up a dull jack-plane to clean up the stick. Just rub it over with a piece of chalk, and your pencil will show nice and clear.

When you want to mark a piece of iron in order to drill a hole, and you must mark through a deep hole in a rough casting, just rub chalk where you want the hole to be drilled, place the casting over it, and rattle down some of the dirt and sand with an awl or old file; then, with a center punch, you can mark the hole to drill.

When you want to bore through a casting, and are obliged to block it out from the face-plate to prevent damage to the latter, you are often troubled by slipping of the pieces of planed iron which you put in. Some machinists wrap them in paper, but that is too much bother. Just rub them with chalk, and they will hold first-rate.

Keep a box of powdered chalk in the pickling room. If sulphuric acid is spilled or spattered upon your flesh, rub it off immediately in the chalk. Acid has such an affinity for chalk that it combines with it instantly, and relieves the flesh.

Points from Consular Reports.

Consul Seymour, Canton, says:

"The time has arrived for a successful advocacy of railways throughout this vast Empire of China, and if the subject is judiciously presented and advocated, there is no reason why, with superior training and experience in and for the construction of these great highways of commerce, economically, efficiently and rapidly, Americans may not take and maintain the lead in this enterprise, for which the American railway system has developed superior talent and facility, and especially as the Government of the United States of America is almost the only one of the great powers of the West which seeks no territorial or colonial acquisitions in Asia or elsewhere. * * *

"I respectfully commend this subject to the attention of our Government and of enterprising Americans. Measures are in progress among European capitalists to take the initiative, by offering loans of money to be expended in railways in China.

"This enterprise can be more successfully carried on by Americans, whose experience in transcontinental railways, whose superior implements and facilities for constructing railways, and whose favorable communications with China give them obvious advantages."

Consul Reiley, Athens, says:

"American manufactures are in great favor in Greece. The great obstacle to their importation is their high price. In consequence of these two facts American goods are imitated in Europe and sold here as genuine. * * *

"I will now enumerate some of the articles which have been suggested to me as likely to find a market here: Garden and agricultural implements, wooden pegs, foot-power machinery, carpenters' tools of all kinds, inks of all kinds, reaping and mowing machines, plows, cradles, shovels, forks, spades, brooms, lumber, nails of all sorts, all canned goods, butter and lard, clocks and watches, cutlery, locks, stoves, leather of all sorts, sweeping machines, churns, hunting guns, revolvers, &c. Any person wishing to know the probable value of such things at Athens I will be glad to answer their inquiries, and wish, in any letter of inquiry, that they will give me the prices at which they can be sold."

Consul-General Smyth, of Monrovia, Liberia, says:

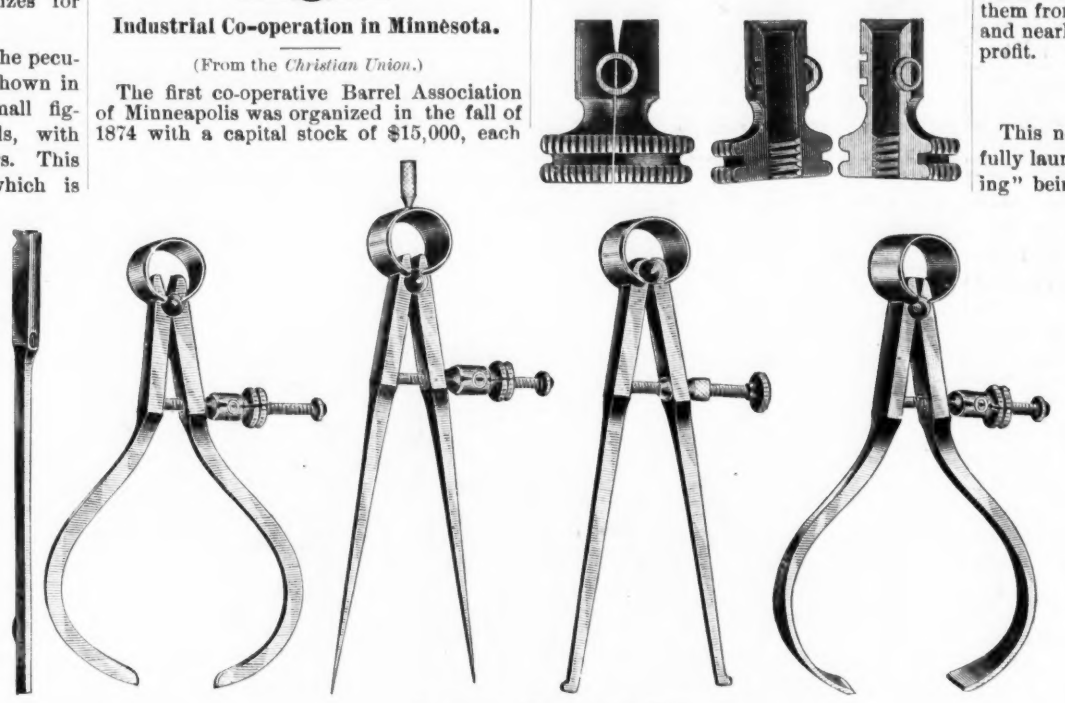
"I respectfully submit that the project undertaken, but apparently abandoned, of steam communication between New York and West Africa would, if carried out, enhance our commercial importance and increase American mercantile gains, constitute a formidable competition between American and European states, and place our country in such relations to that commercial era so generally believed to be near, and the harbinger of fabulous wealth to Europe."

We have heard of more than the usual number of instances recently of men coming to grief through trying to bribe engineers to recommend the purchase of some patented device for use about their boilers or engines. In one instance, it was an offer to divide up on the sale of a boiler cleaning compound that secured the would-be seller an invitation to vacate the premises; in another it was a grate bar. When proprietors hire intelligent, competent engineers, paying them fair wages, they do not have to pay extra commission on stores purchased, or pay for things there is no use for. We have had occasion to know of some instances in which a saving was effected in this way that went a long distance towards paying the wages of the competent engineer. The policy of saving one or two hundred dollars a year on the wages of an engineer is generally a short-sighted one.

Improved Machinists' Tools.

The engraving presented herewith represents machinists' dividers and calipers, made by Chas. P. Fay & Co., Springfield, Mass. In all these tools the bow-spring can be readily removed and the parts separated almost instantly, yet, when together, they have all the rigidity of solid tools. The tension of this spring is almost absolutely equal throughout the entire range of sizes for which the tool is adapted.

Another feature of these tools is the peculiar hinged nut used, which is shown in elevation and sections in the small figures, and in place on the tools, with the exception of the inside calipers. This nut bears on its inner end, which is hollowed out, against the end of the washer, correspondingly rounded. With the pressure of the spring, through the leg, against the washer, it operates to close the hinged nut on the thread of the screw in a manner that will be clearly understood. When thus closed, it is operated as an ordinary solid nut. In changing the set of the calipers from large to small sizes, the nut can be moved instantly to any position on the screw. Thus, if the nut is at the outer end of the screw, by taking hold of the legs of the caliper and pressing them together to about the required size, the nut will follow the washer down the screw; then, upon releasing the legs from the pressure of the hand, the spring will close the nut on the thread.



IMPROVED MACHINISTS' TOOLS.

In the cut of plain calipers a key-hole leg attachment is shown, which can be substituted for one of the caliper legs.

It will be noticed in the cut of inside calipers the bow or spring bears below the fulcrum, the tension of the spring closing instead of opening the legs; then, by placing a tapped steel ball in recess in the leg, and screwing the screw through this ball and against the other leg, a positive spreading device is provided.

All these tools are made on the interchangeable plan, so that any piece can he replaced at small cost.

Frey's Brick and Tile Machine.

We recently illustrated this machine as arranged for making tiles, the description covering the mechanical construction of the combined machine. In this issue we illustrate the machine as arranged for making bricks.

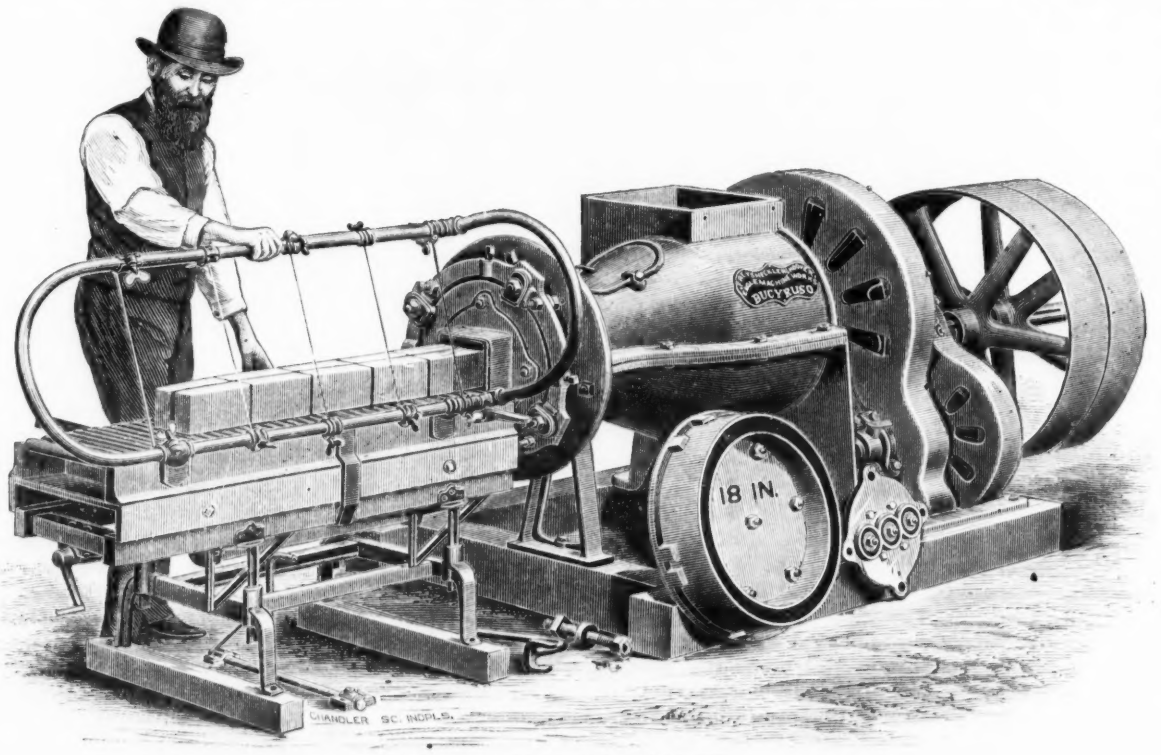
The class of brick-making machines to which this one belongs uses clay, generally direct from the bank, or tempered with just enough water so that the bricks are firm enough to be handled as they come from the machine.

The cut shows the method of forming and separating the columns of clay into suitable blocks for bricks. The die, as represented in the illustration, has two orifices, out of which the clay emerges, being forced out by the screw propellers in the machine. The table directly in front of the die receives the columns of clay on a series of rollers or an endless apron, and by means of steel wires stretched on the hinged frame the clay is cut into the proper lengths.

As these columns of clay have a continuous motion, it is necessary that the table and cutting frame partake of the same movement, so as to make a straight cut. For this purpose the frame rests on rollers (which are not seen in the cut). Before cutting, the whole frame is pushed up against the machine, and while it moves out with the clay the cut is made.

The die piece in front of the machine is constructed to admit various sizes of brick and tile dies, from a building block 16″x10″, to a tile die 25″ outside diameter.

The manufacturers are Frey, Sheckler & Hoover (Eagle Machine Works), Bucyrus, Ohio.



FREY'S BRICK AND TILE MACHINE.

Industrial Co-operation in Minnesota.

(From the *Christian Union.*)

The first co-operative Barrel Association of Minneapolis was organized in the fall of 1874 with a capital stock of $15,000, each member paying in $15 and a weekly assessment of $5. The success of this organization was such that it was followed in 1877 by a second, in 1880 by a third, and in 1881 by a fourth and fifth, and subsequently by two more—all doing well. Each stockholder has but one vote, however many shares of stock he may possess, a condition which tends to prevent consolidation of the stock in a few hands. These co-operative organizations possess a good property, are very thrifty and successful, with a capital stock ranging in each case from $15,000 to $70,000, paid up. They are all doing a good business. What is more important, the coopers, who before this co-operative movement had a poor reputation for sobriety and law and order, now stand high in the estimation of the community as good citizens. The first association, the old "Co-operative," has its own manufactory of stock in Chippewa county, Wisconsin, employing there a capital of $30,000, with prudence and success. The seven co-operative companies are doing business to the amount of $1,000,000 yearly. For these facts we are indebted to Mr. T. G. Rankin, of Minneapolis, whose letter appended furnishes additional and interesting information:

"The co-operative shops have been making rapid as well as continuous progress since 1881. Three more have been started, of which, however, one joined itself to the old 'Co-operative,' the mother organization. There are now seven, all doing well, and working in perfect harmony. They supply all our mills, except three, and are doing fully four-fifths of all the coopering work of this flour city. They claim six-sevenths of all the work done. The boss shops have disappeared, one by one, until there is but one left, and its owner has tried several times to sell out to his workmen.

"The great mills favor the co-operative shops, because (1) they are sure of the best work, and (2) they are never disappointed by them. The shops help each other in a pinch—will divide orders, and otherwise equalize matters. They are filled with a mixed multitude of Swedes, Norwegians, Irish, Germans, Italians and Americans, yet (1) they consult dispassionately, (2) vote fairly, (3) submit without hesitation, (4) work faithfully, (5 choose their best men always, (6) obey implicitly and (7) have unlimited faith in co-operative effort. During their existence, the eight shops have had not less than a score of officers entitled to handle their money. Out of this number not one has given any security, not one has proved careless or dishonest, and not one dollar of deficit or defalcation has been charged against them. After their eight years' experience it is now admitted they are unassailable and unconquerable while united. They have now taken steps to establish a co-operative store on the pure Rochdale system—cash sales at current rates.

"We are now taking stock to buy a township of land in this State; I hope to be one of the company that will form a co-operative village on it this fall. This, in my opinion, will be the very table-land of co-operative effort and of society. I hope to be able hereafter to send you items for publication in regard to it. We can get land for less than $2 per acre, in a region of good soil; good, soft, pure water, fine timber, close to this and other good markets. I am nearly 66; have been a co-operator ever since I began to hear of Rochdale work; have preached it for thirty-five years at least, and now have more faith than ever.

"The stock is held by practical workingmen; they prefer to have each man interested in that way. Stock receives interest only; profits are divided according to wages."

There are twenty-two co-operative productive societies in Great Britain, most of them from ten to twenty-five years of age, and nearly all of them declaring a moderate profit.

The Volta.

This new electric boat has been successfully launched at Greenwich, the "christening" being performed by Miss Stephens, daughter of the partner of the firm of Stephens, Smith & Co., engineers, and contractors for this new vessel. The hull was built by Mr. Skelton, of galvanized steel, and her dimensions are—36 ft. long, 7 ft. beam, and 3½ ft. depth; she draws 20 in. forward and 26 in. aft, with a displacement of 5½ tons. The screw propeller is driven by two Reckenzaun motors, which are coupled direct to and in a line with the screw shaft, the whole of the machinery being placed underneath the floor. The electric current is supplied by seventy E.P.S. cells, which are placed low down in the boat, underneath the floor, and they form thus a perfectly distributed ballast, such as cannot be got in a small steam-boat. There are two masts provided, and sails, so that the electric power can be economised when desirable for voyages of greater duration than the accumulators can supply current for, which is forty miles with one charge. The masts and sails can be quickly applied or removed.

The first official trial trip will be made down the Thames as soon as the internal fittings are completed. After this the Volta is to make a voyage across the English Channel.—*The* (London, Eng.,) *Standard.*

Don't slight a job because you have run against a snag. You started the job determined to do a nice piece of work. Stick to it, and when something breaks or don't come right, do not hurry off the job with "good enough," or "don't care," but stick it out and conquer the thing. Many a man has failed, when he might have succeeded, had he "hung on" a little longer.

Judging from recent English patents, compressed air engines for tramways are receiving considerable attention there. One of these patents relates to the use of a gas engine and pumps for helping up the air pressure.

An international exhibition of flouring-mill, sawmill and oil-mill machinery will be held at Augsburg, Bavaria, beginning July 11, next year. Motive power will be included in the exhibits.

From the English Board of Trade returns, it appears that, while more iron locomotive crank axles break than those of steel, the iron axles run more miles before breaking.

An electric light of 12,000 candle-power is loaned by the Government for use on the tower at the Novelties Exhibition at Philadelphia.

Vertical Boring and Turning Mill.

The cut on this page represents a vertical boring and turning mill designed especially for finishing pulleys. The machine is built in a strong and compact form. The face-plate is geared to give the proper speeds and power to bore and turn from 1″ diam. to the largest size of which the machine is capable. The boring bar has power feed, and quick return. The heads that carry the turning tools are moved together or apart by a right and left-hand screw. These heads are also swiveled so that they can be set to turn taper.

Some of the advantages claimed for this machine for boring and turning are as follows: The machine being vertical, every part is in easy reach of the workman. The work can be readily put in or out. The boring can be done separately, and the pulley turned on a mandrel placed between centers, and driven by carriers on the table.

To use the centers one is placed in the center of the table, and the other takes the place of the cutter bar. By throwing out the feed and using the small hand-wheel shown in front of the machine the center can be adjusted to the mandrel. Another and better plan is to have a chuck for holding the pulley. The boring and turning can be done at one time. In turning, the tool on each side is started in the center of the pulley, one feeding down the other up. By using the handle shown on the left-hand side both heads are drawn together at the same time, bringing the tools in contact with the pulley and to the same depth. This will be found a great saving of time, producing more accurate work.

The cut represents a 40″ mill turning to 20″ face, which has been in use about eighteen months, and has proved to be a valuable tool, not only for pulleys, but for general work. When used as a boring mill, the heads are simply moved apart, leaving the space clear for general boring. The manufacturers inform us that without especial effort they have bored one hundred wheels in ten hours, holes five inches deep 2″ to 3½″ diam., and have turned 28 18″ pulleys 4″ to 6″ face in ten hours. This time includes all adjustments. These mills are built by Muncaster & McKaig, Cumberland, Md.

Have you got a portable power drill in your shop? Perhaps you have a "Scott's" hand drill, but doubtless you rely on the "ratchet" for any work which cannot be got into a drill press. Well, let's see how it works. A big shaft comes to the shop to be stripped, a bevel gear must be drilled and its hub split. It will not go under any drill, so a "jack" is rigged, and Jimmy is set to work with the ratchet.

Jimmy is ambitious. He wants to be a good machinist. He starts off in good style and makes 80 strokes per minute, three strokes to a turn. He looks over to where Tom is running that twist drill 216 turns per minute, then thinks of 26 with his ratchet. After that he will drill the regulation "inch an hour" ever after. Put plenty of portable-power drills in the shop, it will pay.

The Young Men's Christian Association, which will occupy their new building, 502 Fulton street, Brooklyn, in a short time, are organizing several evening classes for the improvement of members. Amongst these is a class in mechanical drawing for Monday and Friday evenings, from eight to half-past nine o'clock. This class, which will begin October 12, will be taught by L. Duvinage, who informs us that it is his intention to teach drawing with special reference to the wants of young mechanics and apprentices in their every-day work. The address of Mr. Duvinage is 547 Lafayette Avenue, Brooklyn. We hope to hear of the success of such practical efforts to benefit members of this association. We understand the association is to have a very fine reading-room, well supplied with current literature.

The average number of patents issued on sewing-machines is said to be about thirty a month.

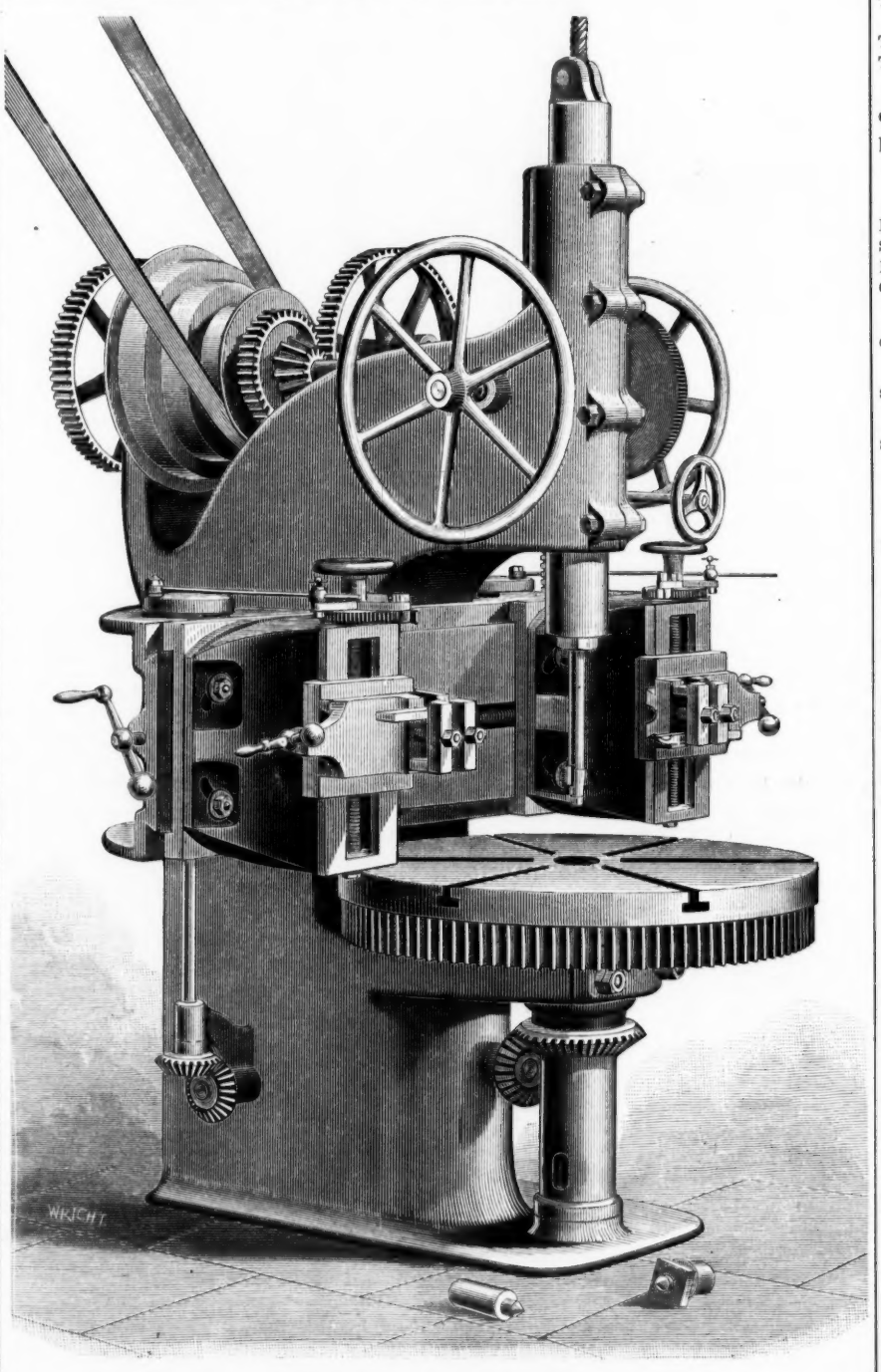
Experiments With Bolts and Screw-Threads.

At the Chattanooga meeting of Mining Engineers, Major Wm. R. King, in a paper read before the meeting, detailed some interesting experiments with screw-threads and nuts. Major King had become impressed with the idea that the standard size of V-threads was much too coarse, and that it weakened the bolt or rod unnecessarily. Detailing one of these experiments, he says:

"Four test-bolts were made. They were all from the same quality of wrought-iron, and were forged at the same time. The shanks of the bolts were turned and the heads and nuts were faced up in the usual way, the outside of heads and nuts being left in a rough state. No special care was taken in fitting the nuts. Two of these bolts had the standard threads of six to the inch, and two had twelve to the inch, and all the heads and nuts were made about two sizes lighter than the tables prescribe for 1½-inch bolts. As the fine thread weakens the bolt much less than the coarse one, and must be proportionately stronger, the principal questions to be settled were whether the thread of the fine-cut bolts would strip or the head or nut would give way before the bolt itself would break.

"These questions were definitely settled by having the bolts carefully tested on the Government testing-machine at the Watertown Arsenal, which was done by the courtesy of Major F. H. Parker, United States Ordnance Corps.

"There was no sign of stripping the thread or bursting the nut in any case, and the coarse thread broke at an average strain of 66,325 pounds, while the fine ones stood 78,400 pounds, or over 18⅛ per cent. more. The fracture in every case was at the bottom of a thread, as usual, but the fine-threaded bolts were elongated 4½ per cent. of their length, while the coarse ones were only stretched 2 per cent., which shows that the 'work' of breaking the former was more than two-and-one-half times as great as in the case of the 'standard' bolts. The tensile strength of the iron was found to be 59,785 pounds per square inch of original section in the coarse-threaded bolts, and 58,495 pounds in the fine ones, showing that the experiments, if anything, slightly favored the standard bolts, and that the results are due entirely to the fact that the coarse threads cut away too much metal; and it is quite probable that even finer threads than those tested, say 16 or 18 to the inch, would give better results.



Vertical Boring and Turning Mill.

"The importance of the results is evident from the fact that a net increase of about 20 per cent. in the statical strength of bolts, and 150 per cent. in their resistance to sudden strains, can be made by simply using finer threads, and at least 40 per cent. of the iron in the head and nut can be saved by making them that much lighter. It is certainly a mystery why manufacturers will persist in throwing away metal and labor in making coarse threads which cut away the bolts unnecessarily at their weakest point, and I can only account for it upon the theory that the present scales have been inherited from the coarse blacksmith work of former years, which has been carried into our modern and more refined practice to avoid changing taps and dies. * * *

"It should be stated that the outside of the thread in all these bolts was $\frac{1}{16}$″ smaller than the body of the bolt, or the latter would have shown greater elongation.

"To test the matter still further, I have recently had three more pairs of bolts made, one pair having 6 threads, one 12 threads, and one pair 18 threads to the inch; but in all other respects the bolts were as nearly alike as it was possible to make them. They were turned from bar-iron 1⅛x2 inches square, so that no forging was required.

"The results were still more favorable for the fine thread, for when broken in a hydrostatic press not a single nut showed signs of weakness, and the bolts with 18 threads to the inch showed unmistakably that they were stronger than the others, although they finally yielded by pulling out of the nut—not by stripping the threads, as we generally understand it, but by actually drawing down the size of the bolt until the greater part of the threads were disengaged. * * *

	Pounds.
The standard bolts broke at an average strain of.....	76,655
Those with 12 threads at.....	92,901
Those with 18 threads yielded at.....	94,248

"It will be noticed that the latter were just on the point of breaking when the nut pulled off.

MEAN RESULTS.

	6 threads.	12 threads.	18 threads.
Relative tensile strength..	1	1.21	1.23
Stretch.....	025	.06	.08
Relative work.....	.025	.0726	.0984
Or.....	1	2.9	4

* * * "The advantages sought by increasing the number of threads per inch are:

1. At least 20 per cent. additional statical strength.
2. Three or four times the strength to resist impact.
3. The finer threads are easier to cut.
4. They are less liable to work loose.
5. In many cases this practice will take the place of upset or enlarged bolt-ends.
6. In such cases it would have the advantage of filling the hole; or, rather, it would avoid the necessity of making the holes larger than the body of the bolts.
7. There will be a saving of 50 to 60 per cent. in weight of heads and nuts; also in cost.
8. Bolts may be placed closer to angles in structures without chipping out for head or nut."

The Navy Yard Machinist.

By James F. Hobart.

"What's the sight for a job, boss?" said John, as he slouched into Snyder's shop.

"Well, I don't know," said Snyder, "I want another man, but I want the right kind of a man, or I won't have any."

"Well," said John, "what kind of a man do you want?"

"I want a man," said Snyder, "who can work at general shop work. I want him to do a job at the lathe, or on a planer; to use that milling machine, or file up a job on the vise. I want him to overhaul old engines, and he must know enough to put a rivet into two pieces of boiler iron, too."

"Well, now, boss," said John, "that just hits me. I have been doing just such work, off and on, for the last 15 years."

"Have you?" asked Snyder. "Well, that's good. Do you know anything about marine engines?"

"Yes, sir, Mr. Snyder; that is exactly in my line. The last engine job I did was on marine engines, and I worked on it nearly a year and a-half."

"Well, John, what do you want a day?"

"O, I shall have to take what the rest do, I suppose; but over there at Uncle's, where I worked last fall, I got $3.25."

"Can't do it, John; almost every man in the shop works for less than $3. Why, I can hire lots of machinists for $1.50 and $1.75."

"Well, hire them, then," said John. "If you want a lot of iron-smashers, why didn't you say so? I thought you wanted a machinist, not a shovel-smasher," and John bit off half a 5-cent plug for a chew.

"Now, look here, John; I can fix it to pay you $2.25 per day. If you can do what you say you can, we can talk $2.50 or $2.75. Do you want to try it?"

"Well, I dunno," said John; "I suppose I

shall have to, if nothing better comes along."

"When are you ready to go to work? Oh! Look here! Where was it that you had that eighteen months' job on that engine?"

"Oh! that was over at Uncle's," said John.

"Over at Uncle's! What do you mean by that?"

"Why," said John, "I mean over at Uncle Sam's yard, there in Brooklyn."

"Oh! Ho!" said Snyder, "so you've been working in the navy yard, have you? Well, just hold on a while; I don't wan't any Navy Yard graduates in my shop. Why, John, just look here; I was over in the yard the other day, where they are stripping the sides of the old twin-screw steamer Intrepid. I sat right down and watched those fellows work. Why, it fairly made me feel tired and weary to see them perform. One man was cutting out countersink rivets. How tenderly he handled that chisel and hammer! How exact he placed that chisel, with unerring precision, upon that rivet. How gingerly he tapped that chisel with his hammer, for fear of cutting out too much rivet with too few blows. How careful he was not to start himself to perspiring. He knew the folly of any such business. He knew that in about ten minutes he would be obliged to relieve his mate, who was all the time looking patiently on, giving our man a chance to chip the rust off a rivet head. Soon the mate says: 'Now, man, you keep still while I stir,' and our man would catch a dreadful cold if he had been perspiring.

"In the course of a week they will get that plate free. All the rivets will have been cut out, and the gang boss will call all hands to lower the plate to the ground.

"How tenderly that gang regards each other's feelings! How they will patiently wait for one another! When one of them picks up a rope to lower the plate, how carefully they keep out of his way while he makes it fast! How brotherly those men are as they all wait for Bob to re-light his pipe! Slowly and surely they lower that plate to the ground, and then all get around to carry it away. They go two steps and lay down the plate again, to make room for little Ike to get hold at one corner. No; they cannot go with it, and leave poor Ike all alone.

"No, John; I guess I cannot use you this time. I can't afford it when business is so dull. I have to get off lots of good work nowa-days to make a dollar."

"Yes," said John; "but we know that we do the best of work in the navy yards."

"No; I don't know it," said Snyder. "I know folks say so; but you don't do work any better than a hundred other shops, which do the same work in one-tenth the time. Why, man, how can you help doing good work, when you are forever about it?"

That same man who was cutting rivets out of the hull of the Intrepid in Brooklyn navy yard on September 2d, said to us, in reply to our remark, that "they have got a year-and-a-half job on the Intrepid."

"You bet they have, and we will make it a two years' job, if they let us alone."

"You see, John, I don't want any such business in my shop; and what's more, *I won't have it!* I want good work, and I get it, every time. Sometimes I get a good, nice job; and again, it is a good, rough job. No matter if a machine is put together with boxes babbitted into rough castings, or whether every bearing is bored and reamed, and then ground to the journals; in either case, everything must be plumb, square and exact, so both jobs are good jobs, although but one is nice.

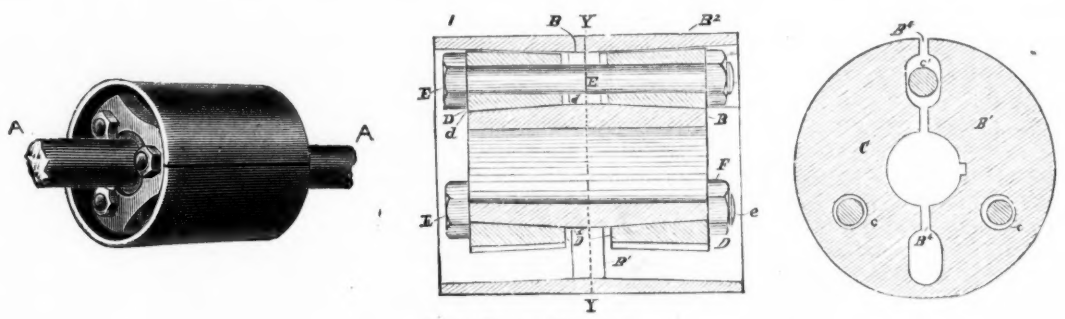
"Go back to the yard, John; you can do it before election. There is lots of tinkering on the old hulks over there, and they can keep you fellows busy. You can putty up one end of the old Essex. By the time that end is done the other end will be rotten, and you can shift over there and patent the whole business as a true perpetual motion.

"I'll give you a job at scraping castings. I will pay you $1 per day to start with, and if you can learn the trade all over again, then you will get 'raised.' It's no use to talk, John; navy yard work is no better than private work; it costs ten times as much to get it done and it takes ten times as long."

New Shaft Coupler.

The accompanying engravings represent a new shaft coupler, made by Charles E. Gee, No. 4 Butterfield street, Lowell, Mass. For the following description we are indebted to the inventor:

B is an inner sleeve, having a cylindrical bore, and is connected midway between its ends by a web, *B'*, to an outer sleeve, B^2, the two sleeves, *B*, B^2 being concentric with each other, and the web being at right angles to the axis of the sleeve. The inner sleeve tapers from the web to its ends, and is secured to the shaft by a key in the usual manner. The outer surface of the outer sleeve, B^2, is nearly cylindrical, which allows of its being used to carry a belt. The shape of the inner surface of outer sleeve is immaterial, except that it should flare from the web toward the ends sufficiently to allow the pattern from which it is moulded to be drawn from the sand.



NEW SHAFT COUPLER.

The piece *C*, which consists of the outer sleeve B^2, the inner sleeve *B*, and the web *B'*, is slotted at B_4 from end to end of the sleeve nearly through the same. The web *B'* is provided with three or more bolt-holes, *c c c*, at equal distances from each other and from the center of the web, one of which holes may be an enlargement of the slot B_4.

In each end of the piece *C*, around the inner sleeve *B*, is inserted a thimble, *D*, *D*. Each thimble *D* is provided with a central conical or tapering bore *d*, large enough to receive and fit closely an end of the inner sleeve *B*. The shape of the outer surface of the thimble *D* is immaterial, as it does not come in contact with the outer sleeve B^2. Each thimble is provided with as many bolt slots *d* as there are bolt holes *c* in the web *B'*, and these bolt slots run from end to end of the thimbles, and open into the central bore *d* of thimble, and are so arranged in the thimble that the slots *d* of one thimble may be in the same line with the bolt holes in the web and the bolt slots of the other thimble.

Through the bolt slots and bolt holes are placed bolts *E E*, having screw-threaded ends *e*, *e*, which project beyond the outer ends of the thimbles. On the ends *e*, *e* of the bolts *E* are turned nuts *F* against the outer ends of the thimbles, drawing the thimbles toward each other over the tapering ends of the inner sleeve *B*, causing the latter to close upon the shafts, and securing the adjacent ends of two lengths of shafting together. The piece *C* may be of cast iron; but the thimbles are preferably of steel, and may be drop-forged.

This coupling may be used to connect two shafts of different sizes, and the inner sleeve being split entirely through on opposite sides allows of the ends of the sleeve being unequally contracted to a greater extent than if the sleeve were split only on one side, and the bolts do not interfere with the closing of the slots in the sleeve.

Science Hall of the Wisconsin State University, which was totally destroyed by fire in February last, at a loss of $120,000, is being rebuilt under an appropriation of $200,000 from the State of Wisconsin. Fine and substantial buildings will be erected, and it is said will be thoroughly equipped with the latest improved machinery and tools for the instruction of students in drafting, pattern-making, and machine-shop practice. They will also erect a foundry especially to instruct students in the art of founding.

Toughened Cast Iron.

BY ROBERT E. MASTERS.

In 1875 I was employed by a firm who had a great deal of trouble with some of the pinions cast in their foundry; they did not give a reasonable amount of service, this was the cause of complaint from customers who were using machines made by the firm, and all of the complaints were made concerning two pinions used in saw-mill machinery. One of them was a bevel pinion of 36 pounds weight, the other a small spur pinion of 8 pounds weight. Of the other pinions on the same machine, and of those used on other machines, no complaint was ever made. In the two pinions referred to, various mixtures of the best grades of cast iron were used to no purpose. In boring out and fitting up in the machine shop they would seem to be very tough and strong, yet when they were placed in operation in a part of the machine where they had a great deal of labor to perform, the teeth would wear out and break-off down even with the body of the pinion in a comparatively short time. Changes were made several times in the patterns and machine. But as the labor to be performed was just as great, the result was the same.

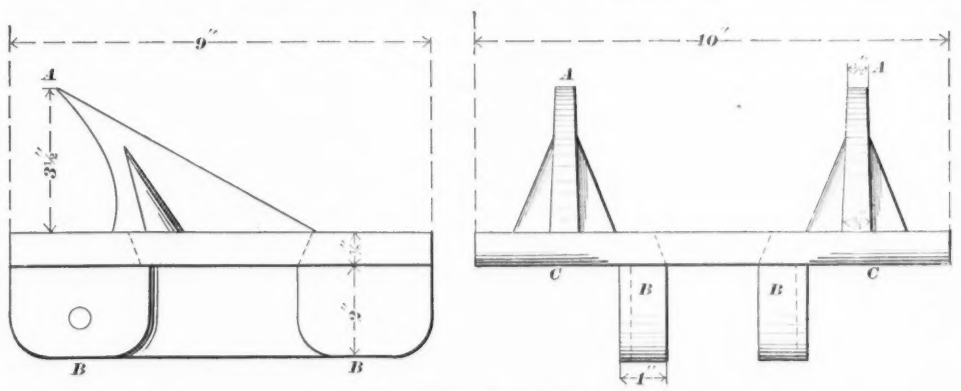
We concluded to use a wrought and cast iron mixture. In a 125-pound ladle we put 15 pounds of light wrought-iron scrap, and tapped direct from the cupola into the ladle.

The iron, when it left the cupola, was as bright and fluid as quicksilver; by stirring the wrought iron through it it melted and mixed thoroughly with the cast iron, and while it lowered the temperature of the whole body of the metal considerably, it was still in good condition to pour. Pinions made from this mixture were as tough as malleable iron; we found on testing some of the first we made that the teeth would batter down and bend before they would break off. On trial they were found to stand up to their work and wear in proportion to other parts of the machine.

In making a mixture of this kind, from 12½ to 18 per cent. wrought iron can be used, according to the grade of wrought iron and the class of work wanted. Old nails and pieces of core rods that have got broken and bent beyond use in the foundry, together with old horseshoes and pieces of light wrought-iron scrap from the blacksmith shop, if "tumbled" until they are bright, are just as good as anything.

The best way we found to get a good mixture, was to take a 125 or 200-pound ladle after it had been used to pour off a ladle or two of cast iron, and was thoroughly heated up, pour the cast iron out clean and put in the wrought scrap, and let it stand while the iron is accumulating in the cupola for some heavier piece. Then, when the cupola is tapped out into the larger ladle catch over with the ladle for the mixture; this gives the advantage of the scrap getting hot in the ladle before it is tapped in on, so that the iron lays quiet when the catch is made. It also gives a thorough mixture of the cast iron, hot from the cupola. If the iron is not good and hot as it flows from the cupola I would advise any one not to try it, for they will only succeed in making a ladle of mush in place of castings of wrought-iron mixture.

Should the wrought scrap be heavier than the class mentioned, say from ½" to 2" round or square pieces, or if a large percentage of wrought iron is desired in the mixture, it is a better plan to tap in on the wrought scrap once, and pour the fluid metal off into some work that will take the metal fast. This leaves the wrought scrap in the bottom of the ladle heated to such a high temperature that by tapping into the ladle again immediately, the wrought iron soon becomes fluid and mixes with the cast iron so that small, thin castings that require to be very strong, can be poured with it. By this practice as high as 20 per cent. of wrought iron can be used in iron that is not extra hot.



TOUGHENED CAST IRON.

We have in the last few months been using 20 per cent. wrought scrap in some castings that have been giving a great deal of trouble. One of them is an 18" bevel-gear, well proportioned and strengthened on the back with braces radiating from the center; the other is a 6" bevel pinion. The gear and pinion work together. When made of cast iron alone, any extra strain coming on them when at work would either crack the gear across the face or around the hub, or strip the teeth off the gear or pinion. Since we have been making them of the wrought mixture we have had no trouble.

A few months ago a gentleman who is in charge of a foundry in the lumber districts of northern Wisconsin, and who has contributed some interesting articles on foundry practice to the AMERICAN MACHINIST, wrote me:

"I want to make some attachments for bull chains used for pulling saw logs out of the water, up a run way to the mill. The firm has always sent away and had them made of steel; we use 60 per week on an average. What mixture would you use?" I advised him to try a mixture such as is described in this article, and requested him to let me know what success he met with.

Lately I received the accompanying sketches (page 5) giving a side and back view of the attachments.

He writes me: "The chain is an endless one, and the attachments are riveted to the chain at *B*, *B*, at equal spaces—in coming up out of the water at the end of the runway, the points *A*, *A*, which run to a feather edge, catch in the logs and haul them up. I tried the mixture you advised. The wrought iron I used was old belt hooks, which had been through the fire when our shop was burned a year ago. The hooks were made out of good Norway iron. In a 500-pound ladle I put in 50 pounds of the hooks and tapped about 350 pounds of iron in on them. The iron got a little dull, but the castings run all right. I think it best to use a smaller ladle. The next time I used the same percentage in a 125-pound ladle. The hooks melt better, and the iron keeps hotter. The points at *A*, *A* must be tough, and I find I can hammer those made from this mixture down like malleable iron. The wearing surface at *C*, *C*, where they slide on the rails, should be harder. This I can best accomplish by chilling at that point. The attachments weigh 28 pounds, and the mixture is just what we wanted."

New Labor Statistics.

A building was in process of erection opposite a public building, in Washington City. One of the clerks who had been looking out of the window for some time, said to another clerk who was reading a newspaper:

"I have been watching that workman over there, and he has not done a lick of work in all that time. I wonder what he gets paid for?"

Just about the same time the workman remarked to a fellow workman:

"Just look at that government clerk over there. He hasn't done anything except look out of the window for the last half-hour. No wonder the country is going to the dogs."

"I'll tell you a good thing," said the Iowa dealer from Fort Dodge, who came in "just to have a chat." "It illustrates how green a drummer sometimes is. A man from Wisconsin—say Oconto, for instance—sold a yard man in our town a load of cedar posts. There were 633 posts all told, the price was 10 cents a piece, and the amount $63.30. The freight bill was $69.42, which our lumber dealer paid. He then asked the Wisconsin post dealers to remit him the difference, $6.12, and they would be square. The Wisconsin men went to talking about the pay for their posts, but our townsman said he owed them nothing, but that on the other hand they owed him. He had bought the posts delivered. An attorney was consulted by the Wisconsin gentlemen, but he told them they had no case. The drummer, I suppose, knew a cedar post when he saw it, but it probably did not occur to him that the railroads make any charge for hauling." —*Northwestern Lumberman.*

The dearth of news wherewith to get up a respectable bulletin board must be a sore trial to the daily press. "A Terrible Boiler Explosion" blazoned in the most conspicuous of characters induces the unwary to invest three cents, and a painful search through the columns reveals the meekest kind of a three line item without particulars.

Sir L. Playfair, speaking at Dundee yesterday, in connection with the opening of a secondary school, dwelt upon the imperative necessity of technical education, and lamented that the kingdom was greatly behind the American Republic in the attention it paid to this subject. — *The Standard* (London).

If it is true that China is to awake at last from her long lethargic sleep and commence an era of railroad building, some enterprising Yankee should find a job there in initiating the managers into the mysteries of "combinations," "pools" and "deals."

Laying Out Sheet Iron and Boiler Work.

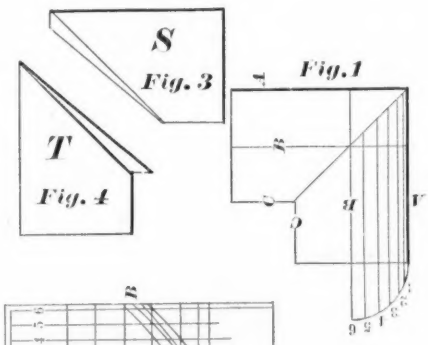
By GEORGE MARSHALL.

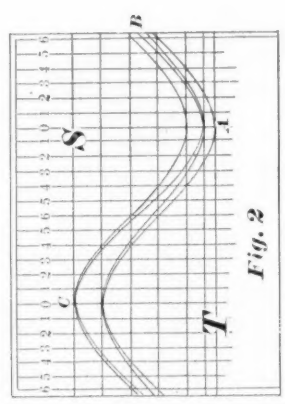
FOURTH PAPER.

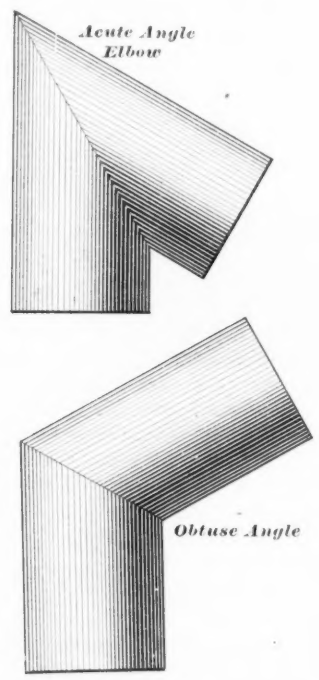
THE ELBOW—ACUTE, OBTUSE OR RIGHT-ANGLED.

In this, as in the preceding paper, first make a sketch of the piece you desire to produce. If a square elbow, of course your lines will be at right angles with each other. In this case, the sketch Fig. 1 represents a square elbow, the principle governing the others being identical with this.

In the square elbow, one quarter circle is all that is required to be drawn, as the accompanying figures show an acute and obtuse-angled elbow; they are submitted without explanation, leaving their investigation to the practice of the student.







distance from the center of figure to the opposite points are the same; hence, by using the center line as a starting point, we can measure from *A* to *B*, or *B* to *C*, Fig. 2, with like results.

It is advisable, when possible, to cut both pieces of elbow out of the width of plate, thus saving material, at the same time allowing sufficient space between the pieces for flanges, one of which is put on each section, as shown in sketch. At points 6, 6, at sides and center, my custom is to punch a hole in each of the pieces, allowing at that point but an ordinary lap, from thence increasing to a flange on one side, decreasing to the line on other side, as shown in Fig. 2. In piece marked *S*, the flange is on the long side; on *T* flange is on the short side. Sketches 3 and 4 will show the position of flanges when turned, and explain the necessity of their being so placed.

As far as the connecting of the elbow is concerned, both can be made of same diameter, but if there are large and small courses to connect with, it will be necessary to lay out the pieces to suit. In these pieces the lap is shown on the side, and by rolling the pieces, as shown, the laps will be, when connected, on opposite sides. The

LETTERS FROM PRACTICAL MEN.

Fitting Keys.

Editor American Machinist:

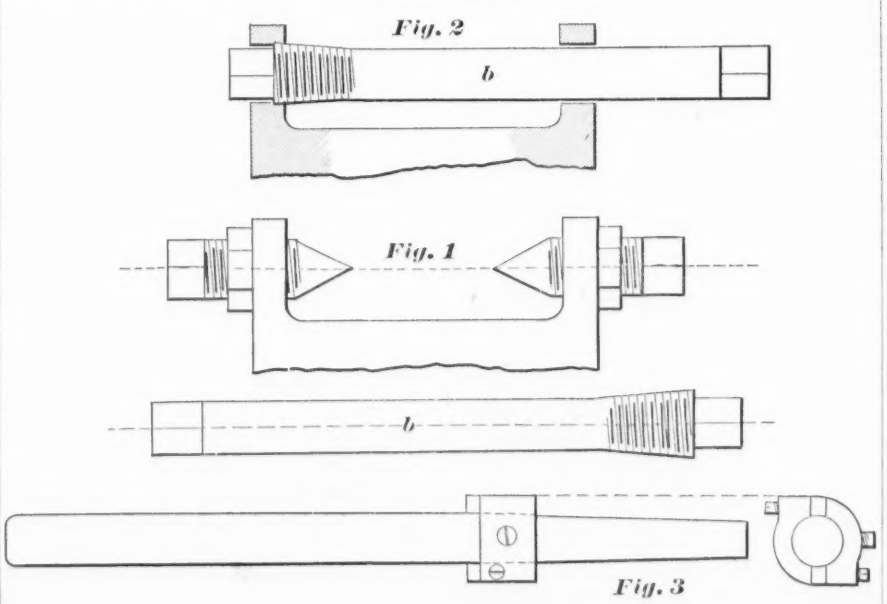
An article in the AMERICAN MACHINIST of Sept. 19, is likely to mislead some. For locomotive driving wheels, I think the key should fit on all sides, and I believe this is the universal practice. But if you apply this to pulleys, it will be almost sure to throw them out of truth, for the reason that the hole in the pulley is a little larger than the shaft. I have always found it advisable to fit keys in pulleys and fly-wheels tight at the sides and free top and bottom.

A. THICKETT.

How to Align Center Screws.

Editor American Machinist:

When center screws are used as indicated in Fig. 1, whether for pivot boxes, universal joints, or to secure the delicate action of some detail of a machine, it is important that they should be placed exactly in line with each other.



To insure this exact alignment, the tap for the job should be formed as shown at *b*, Fig. 2, the stem of the tap being of sufficient length to extend through both holes and large enough to fill them pretty snugly, yet work easily. It should be squared at both ends, so that the wrench may be used on either end. The thread of the tap should be short and near the end, as shown, to prevent springing when tempered. When used, the tap should not be turned quite far enough to disengage its thread from that of the hole, but should be turned back when nearly through (as seen in Fig. 2), and thus insure the integrity of the thread in the hole.

If check nuts are used (as shown in Fig. 1), their seats should be faced off before the holes are tapped. A common form of tool for this purpose is shown in Fig. 3. It may be worked by hand in a ratchet stock, or by power, according to the nature of the job.

These ideas are not new, yet they may be new to some. The trouble with these "line traps" is, that their thread is often made so long as to spring in tempering. In case the holes to be tapped are quite large, as in some boiler work, the tap may be made in the form of a short thimble, so as to be used on stems of various lengths.

F. G. WOODWARD.

Throttling vs. Automatic Cut-Off Engines—The Pay-Day Question.

Editor American Machinist:

In No. 38 is an article on the "Economy of Throttling Engines." The first engine put in our mill to run electric lights was a slide-valve engine 10″×12″ regulated by one of the most sensitive of throttling governors. The consumption of water by card was 63 lbs. per horse-power. It was so expensive to run that it was taken out and an automatic 8½″×10″ high-speed engine was put in its place, and the consumption of water lowered to 34 lbs. per hour per horse-power.

The clearance of the 10″×12″ was a trifle over 16 per cent., and of the 8½″×10″ 8½ per cent. Counting out the clearance in both cases the consumption by throttling engine was 53 lbs. of water, and of the automatic 31 lbs. The steam was taken from the main boilers, so there was no chance to ascertain the amount of coal. The power used was for 28 Brush lights of 2,000 candle-power. Even if the automatic had the larger clearance the throttling engine could not compete with it.

Mr. Frank Richards brings up the question of the best pay-day. In a manufacturing city of less than 30,000 population it was the custom to pay the 10th or 15th of the month, and when those days fell on Saturday there were a great many who did not get rested over Sunday, and didn't put in an appearance Monday morning. Of late they have paid once a week. Now, in large works it would be impossible to pay up to and including pay-day, and if paid Saturday night it would be only up to Thursday or Friday night. Manufacturers having paid on a fixed day of the month, and that day coming all days of the week their experience was that when pay-day came on Saturday their business was interrupted more than on any other day, so that when they adopted weekly payments they paid for a week's work from Monday till Saturday night and fixed the pay-days, some Tuesdays and others Wednesdays, and, from former experience, they believe it a better plan for all concerned than Saturdays. In the above city the laboring class support some 150 drinking places.

Mr. Richards does not believe it fair to claim that a marked $20 bill found in a saloon was all expended for drink. A young man, a mechanic, was paid regularly $100 per month, when the pay-day was once a month, and as it is the custom to pay liquor bills before any other, he always stopped at his favorite drinking place on his way home, and not unfrequently left the entire $100 there before morning, and, what makes it worse, this is not an isolated or uncommon case.

In a case like this the pay-day does not make so much difference, but to a great many who get out Saturday night more than any other, and also the growing number of beer gardens, and places of like nature, where both sexes congregate, a full purse Saturday night is apt to be expended for that which, intellectually or morally, is not very elevating. W. E. CRANE.

An Extemporized Bending Machine.

Editor American Machinist:

In a certain shop that does a general contract and repair business, it was once required to bend into U-shape some sheets of iron 54″x144″, three-sixteenths thick, the radius of the curve to be 24″. We had no "Brown" to tell us how to do it; no boiler-

shop within 20 miles, so rolling or asking for information from sheet-iron workers was out of the question. The method selected was original with the parties using it, and gave such excellent results that I send it to you for the use of such of your readers as may need it.

Two 10″ blocks were placed on the floor, 6 ft. apart, and directly under an overhead cross beam. Upon these blocks a piece of 4″ round iron about 8 feet long was laid, and secured by two 6x6 feet posts reaching to the overhead beam. Two 16-foot lengths of 3½″ round iron were then laid past the ends of the 4″ piece, and at right angles to it, extending about 12 feet one side and 4 feet the other side. On top of these two 10-feet lengths of 3″ round steel were laid parallel to the first piece. These were fastened with chains so that they could separate only 36″.

A sheet was then brought in and a line made across it 2″ to one side of the middle. The sheet was then passed under the 4″ bar, over the two 3″ bars, until the line was even with one side of and parallel to the 4″ bar; then two semicircles of 1½″ square iron 18″ radius were placed on the sheet under the 4″ bar to act as a sort of former to prevent too short kinks.

Two sets of differential chain blocks were attached to the short ends of the 16 feet lengths of iron and to the long ends, which extended out doors, the power hoist, which was used for loading machinery, etc., was attached.

The long ends were raised about 3 feet and blocked there, then the men at the chain blocks were told to "hoist away." As the bars slowly raised, the sheet bent around the formers in an even, regular curve, without a kink or break. When the shafts had reached a level position a twister was introduced, in the chain holding the two 3″ bars, and they were thus brought a little nearer together; a little hammering was done on the inside of the curve to give it a set, and the framework of shafting lowered to the floor.

The method was crude, and when fairly at work, we wondered if a boilermaker, seeing our way, would give us the laugh.

But the job was done with tools extemporized from the material in the stock-house, which, when used, was returned uninjured. The actual expense of the rig was just the time it took to put it up and take it down again; and then it did the work so nicely that, with but very little hammering, the edges of the bent sheets were easily forced into the grooves in the cast-iron end-pieces for which they were intended.

The radius of the 1½″ square semicircles was taken at ¾ that of the finished sheet, to allow for the spring of the iron when released. I am now of the opinion that ⅔ would have given slightly better results.

F. L. JOHNSON.

Appleton, Wis.

File Re-cutting—does it Pay?

Editor American Machinist:

This depends on two facts: what do you *pay* for your files, and what do you *pay* to have them re-cut?—with the additional consideration—is the party who does your re-cutting possessed of a complete knowledge of the work to be done, and so morally reliable as to avoid salting each package of files returned with a few either too thin and consequently weak to be serviceable, or bereft of a fair portion of their efficiency owing to perhaps two inches of their points being lost due to overheating in the hardening and consequent cracks and breakage? Grant that the re-cutter does his work well, which is the exception, we will now consider the first two points made, taking each by itself as to cost, and afterwards in comparison based on actual figures as to the economy.

If the reader of this article is still possessed of the idea that a hand-cut file is superior to one *properly* cut by a machine, the writer will at once admit the economy. Why? Because the high price of a *well* cut hand-cut file leaves a large margin for the re-cutter to work on. But if he is of the opinion of a large majority of our best mechanics to-day, who are ready and do affirm that a machine-cut file *properly* cut is equal in point of wear, then the writer can show by figures given below, taking the prevailing price lists for both new and re-cut files, that any file 10″ and under, *re-cut*, is more expensive than a new file 10″ and under.

As before stated, the writer will take the prevailing lists for both new and re-cut files, and fair average discounts from each list. On the re-cutting list a discount of 40 per cent. off, and on the file list a discount of 60 per cent. off.

NEW FILE.

Flat bastard 12″ $5.80, less 60 per cent.	$2.32
As old scrap, 1 dozen of above files are worth—weight 12 lbs. at 1 cent.	.12
Net cost.....	$2.20

RE-CUT.

Flat bastard 12″ $4.00, less 40 per cent.	$2.40
Difference *in favor* of new file nearly 10 per cent, or.....	.20

In taking a 12″ flat bastard file, the writer has been fair to both sides of the question, as it is, so to speak, the dividing line. As you decrease in length from this size, the proportion against the value of re-cutting increases, and if you increase in length from 12″ upwards, the proportion figures in favor of re-cutting and against the new file. The reader must bear in mind that on this comparison of prices the writer has not taken into calculation the third consideration, the percentage of *loss* on a dozen re-cut files from liability to breakage owing to their being thin, from broken pointed files returned as serviceable, and from *crooked* and *twisted* files with which no mechanic can do an accurate piece of work.

Covering this last feature we would refer to a re-cut mill or float file for lathe use when the slightest variation from a level surface or a straight file will ruin the work. How much of a loss this is the writer leaves the misguided to determine by examining the next lot of re-cutting. Let the proprietor of any works where files are used, take his pencil, a half-hour's time, a re-cutting list and a file list, and an invoice of goods made up from each list, and at the end of a half-hour I think he will write a general order to, in the future, send old files to the scrap heap or to be broken up, and in small lots fed into the ladle when a little harder than the ordinary casting is desired.

JAMES D. FOOT.

Engineering in an article on "Steam Tramway Locomotives," says:

"It is now thirteen years since the first locomotive steam tramway engine was brought into use on the public highways. The makers were Messrs. Merryweather & Sons, of London, who have for many years enjoyed a world-wide reputation as fire engine makers.

"The first line opened was in Paris, where some forty engines were used to perform the tram-service in place of horses. Since that time the amount of capital embarked in steam tramway enterprise has been steadily growing, and at the present time the manufacture of tramway locomotives, and special cars for use in the streets, find employment for no less than 3,000 mechanics. The use of these engines effects a saving in the running expenses of the tramway companies that have adopted them, amounting in the aggregate to £30,000 per annum, and in addition gets rid of the unavoidable cruelty which is occasioned by the employment of horses for street tramway work."

Tables for Calculating Strength of Boilers and Boiler Stays.

BY A. G. BROWN.

The table below is an outgrowth of the United States marine inspection laws, relating to the safe working pressures of boilers. The rule for finding the working pressure authorized by the law is as follows:

$$\frac{\text{Tensile strength of shell sheets} \times \text{thickness}}{\text{inner radius of shell (inches)} \times 6} = \text{greatest pressure allowed for single riveting with punched holes.}$$

To this result 20 per cent. is added when the longitudinal seams are drilled and double-riveted. No allowance is made by the marine inspectors when these seams are double-riveted if the holes are not drilled, although repeated experiments have demonstrated that, with good material and punches correctly made, the metal around a punched hole is slightly stronger than would be the case if the hole had been drilled. The reasons for this need not be referred to in this article, as no matter how good they may be, the law remains unchanged.

Desirous of saving time in finding the thickness of shell needed for a given pressure, or the pressure that would be allowed with a given thickness of shell, this table was made; in it the calculations were all performed, excepting that relating to the radius of the shell; and in order to make the last operation still quicker, they were worked out with reference to the diameter instead of the radius, as it is slightly easier to divide by 45 than by 22.5, and the diameters are usually whole inches.

To make use of the table below, divide the number under the proper tensile strength and opposite the right thickness, by the inner diameter, in inches, of the largest course in the shell. The letters at the head of the columns refer: *P* to punching and single-riveting, *D* to drilling and double-riveting.

The second table was calculated for stay and socket bolts on flat surfaces, but will answer for any system of bracing, the figures given being the greatest distance between centers of rivets.

TENSILE STRENGTHS.

Thickness.	40000		45000		50000		55000		60000		65000		68000		70000		72000		75000	
	P	*D*	*P*	*D*	*P*	*D*	*P*	*D*	*P*	*D*	*P*	*D*	*P*	*D*	*P*	*D*	*P*	*D*	*P*	*D*
1-16	833	999	936	1123	1040	1248	1145	1374	1250	1500	1354	1628	1416	1699	1458	1749	1500	1800	1562	1874
3-32	1249	1498	1406	1687	1562	1574	1718	2161	1875	2250	2031	2437	2124	2548	2187	2624	2250	2700	2343	2811
1-8	1666	1999	1875	2250	2083	2499	2291	2749	2500	3000	2708	3249	2833	3399	2916	3499	3000	3600	3125	3750
5-32	2083	2499	2343	2811	2604	3124	2864	3436	3125	3750	3385	4062	3541	4249	3645	4374	3750	4500	3906	4687
3-16	2499	2998	2812	3374	3124	3748	3437	4124	3750	4500	4062	4874	4250	5100	4374	5248	4500	5400	4687	5624
7-32	2916	3499	3281	3937	3645	4373	4010	4812	4375	5250	4739	5686	4958	5949	5104	6124	5250	6300	5468	6561
1-4	3333	3999	3750	4500	4166	4999	4583	5499	5000	6000	5416	6499	5666	6799	5833	6999	6000	7200	6250	7500
9-32	3749	4498	4218	5061	4687	5624	5156	6187	5625	6750	6093	7311	6375	7650	6562	7874	6750	8100	7031	8437
5-16	4166	4999	4687	5624	5208	6249	5729	6874	6250	7500	6770	8124	7083	8499	7291	8749	7500	9000	7812	9374
11-32	4583	5499	5156	6187	5729	6874	6302	7562	6875	8250	7447	8936	7791	9349	8020	9624	8250	9900	8593	10311
3-8	4999	5998	5625	6750	6249	7498	6874	8248	7500	9000	8124	9748	8500	10200	8749	10498	9000	10800	9375	11250
7-16	5833	6999	6562	7874	7291	8749	8020	9624	8750	10500	9479	11374	9916	11899	10208	12249	10500	12600	10937	13124
1-2	6666	7999	7500	9000	8333	9999	9166	10999	10000	12000	10833	12999	11333	13599	11666	13999	12000	14400	12500	15000
9-16	7499	8998	8436	10123	9373	11247	10311	12373	11250	13500	12187	14624	12749	15298	12124	14548	13500	16200	14062	16874
5-8	8332	9998	9375	11250	10416	12499	11457	13748	12500	15000	13541	16249	14166	16999	14582	17498	15000	18000	15625	18750
11-16	9165	10998	10311	12373	11456	13747	12602	15122	13750	16500	14895	17874	15582	18698	16040	19248	16500	19800	17187	20624
3-4	9999	11998	11250	13500	12499	14998	13749	16498	15000	18000	16249	19498	16999	20398	17499	20998	18000	21600	18750	22500
13-16	10832	12998	12180	14624	13539	16246	14894	17872	16250	19500	17603	21123	18415	22098	18957	22748	19500	23400	20312	24374
7-8	11665	13997	13124	15748	14579	17494	16039	19248	17500	21000	18957	22748	19832	23798	20415	24498	21000	25200	21874	26248
15-16	12498	14997	14062	16861	15619	18742	17184	20620	18750	22500	20311	24373	21248	25497	21875	26247	22500	27000	23437	28124
1	13332	15997	15000	18000	16666	19999	18332	21998	20000	24000	21665	25998	22666	27199	23332	27998	24000	28800	25000	30000

It will be noted that the thickness of sheets increases with the diameter of bolts; the reason is plain enough. If ⅞″ bolts were used to stay ¼″ sheets, the sheets would buckle and the heads pull through before the proper strain on the bolts was reached, which would be a clear waste of material.

The strains on bolts spaced according to the table would range from 6,000 to 10,000 lbs. per square in. of section.

The variation in the strains is accounted for by the fact that the bolts, irrespective of their tensile strength, must be spaced so closely as to prevent the sheet buckling between them.

The table was made in conformity with a few experiments made by the writer, and a number gathered from other sources, and will be found to have a factor of safety of about 5 or nearly double that of the shell.

STAY AND SOCKET BOLTS.

	Stay Bolts.			Socket Bolts.		
Diameter of bolts	5-8	3-4	7-8	3-4	7-8	1
Thickness of sheets	1-4	5-16	3-8	5-16	3-8	1-2

Working pressure.	Greatest Distance Between Centers.					
60	5.1	6	6.9	6.6	7.6	8.6
80	4.6	5.4	6.2	6	6.9	7.8
100	4.3	5	5.7	5.6	6.4	7.2
125	4	4.6	5.2	5.2	6	6.8
150	3.8	4.4	5	4.9	5.6	6.3

If the sheets are of copper the bolts must be placed closer together, as copper will buckle much easier than iron or steel.

One of the most noticeable features of modern machine design is its severe plainness as compared with a good deal of the practice of twenty years ago. In some of the machine tools then made the succession of fancy forms seemed to have been purposely designed to give the boys exercise in turning, and in that respect they were an unqualified success. Aside from this their most obvious use was to hold dirt where it was about impossible to wipe it off. It is evidence of better taste that such forms no longer look well. Nicely rounded corners and smooth surfaces look better because they are better. In the way of finish but little is now done for the sake of mere show. Parts that require frequent cleaning are finished because they wipe better, and they are well finished, because well finished surfaces are not so likely to rust as those poorly finished. To-day buyers look upon a machine crowded with ornamental finish with some distrust, as likely to be deficient in important particulars.

The reservoir system, by which it is proposed to secure, during the dry season, sufficient water in the upper Mississippi for navigation purposes by storage reservoirs has been tried to a sufficient extent to, it is believed, demonstrate its entire feasibility. The plan, which contemplates arrangements for holding back in lakes immense quantities of water, will now be carried to completion.

It is the opinion of prominent railroad men that a constant depreciation of rolling stock is going on, and that this must be made good in a short time, giving an impetus to business in this direction. But the number of car works in the country is too great for the needs, and in the end it looks as if some of them must go out of business.

Texas towns are in a feverish way regarding the construction of water works, if we may judge from the reports in local papers. Apparently every town of any importance in the State that is not now putting in water works, is agitating the question of doing so. It is generally an excellent way of investing money.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

Horace B. Miller, Pres't.
Jackson Bailey, Vice-Pres't.
Lycurgus B. Moore, Treas. and Sec'y.

96 Fulton Street, New York.

Jackson Bailey, Editor. Horace B. Miller, Business Manager.

F. F. Hemenway, - - Mechanical Engineer.

The American News Company,

Publishers' Agents, New York.

The International News Company,

11 Bouverie Street (Fleet Street), London, Eng., will receive subscriptions for the American Machinist, at 14/7 per annum, postage paid.

DEALERS SUPPLIED BY

The American News Company, New York.
The American News Company, Denver, Col.
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The Montreal News Company, Montreal, Canada.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

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$2.50 a year in advance, postage prepaid in the United States and Canada.

$3.50 a year to Foreign Countries, postage prepaid, except Bolivia and South Africa, to which the subscription rate is $4.50 a year, postage prepaid.

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Transient, 35c. per line, each insertion.
"Business Specials," 50c. a line.

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NEW YORK, OCTOBER 3, 1885.

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One Lesson of Low Prices.

Times of low prices in the machine business are not always altogether bad in their effect. In such times a good many machinists are likely to find out that the reason why they cannot sell so cheaply as their neighbor is that it costs them more to manufacture; something they might never learn in times of high prices. There are yet in numerous machine shops a good many old-time tools, that the proprietors cannot afford to use in dull times; they handicap the business too heavily in the race for low prices, when everyone is satisfied with the smallest kind of a balance on the right side in the way of profits. Modern labor-saving tools are excellent for increasing the output in times of good prices; they are sometimes more valuable in enabling a manufacturer to live on the prices he can get in dull times. To those who profit by the knowledge they are likely to get of their needs in this respect, times of sharp competition, occasionally, may be, if not quite a blessing, still not without something in the way of compensation.

But it is commonly looked at in the light that it is not advisable to invest money in new tools and appliances to take the place of old ones when no money is being made in the business. It is the wise man who sees that the judicious expenditure at such a time in the direction to cheapen the cost of production may be all that is needed to change a business from a money-losing to a money-making one.

It is always easier to make changes here and there in shop equipment and manner of doing work in dull times, than when everything is driving along at full capacity; then orders are apt to be so far ahead, that there is no time for changes. If changes are made to the end of manufacturing cheaper, with prices at the lowest, then there is an incentive to sharp consideration to make them in such a way that the business will show some profit at these low prices; then when prices are better, profits will be correspondingly increased. In good times there is not only less incentive to make changes, but in making them their bearing on the cost of manufacture is not likely to receive so close attention. It is only a matter of more or less profit, and there may be a fair profit anyhow; the inclination to let well-enough alone is always a strong one.

For those who are able, financially, to make changes that the last year or two of small profits or no profits have shown to be necessary, it is a good time to do it. They can be made at much less cost now than when business is brisk, and they will generally be more satisfactorily made. A great many are taking advantage of the lull to plan needed changes which, in the majority of cases, will *not* be made when times get better, and the cost of production is, seemingly, of less importance.

Must Pay For the Medals.

We recently published an item to the effect that it was rumored that the exhibitors at the New Orleans Exposition who were awarded medals would be invited to pay their cost. Since then we are in receipt of a letter from one of the fortunate exhibitors enclosing a postal card upon which is printed the following:

We this day mail you certificates of award. Orders for gold and silver medals will be issued from this office to exhibitors entitled to them.

Price of gold medal..... $80 00
" " silver " 8.00

To be paid at Philadelphia to manufacturer. Bronze medals not yet ready.

Gus. A. Breaux,
Chairman Committee on Awards.

From this it appears that those to whom medallic favors are awarded will pay for them if they get them. Seriously, we believe the price is too high; it is a good deal more than the medals are worth as bullion, which is, after all, their chief value. There is no longer any novelty in the medal business, and when it lost that it lost all its value. Ordinary mortals—those who buy machines and machinery—place but little reliance upon the discrimination of the jurors who award medals at fairs from knowledge gained from a few minutes, or at the most a few hours observation. Nothing is more common than to find several exhibitors at the same fair and in the same line in possession of medals of the highest award, and a wrangle in which outsiders long since ceased to take any interest is frequently the result.

There is one advantage of requiring the recipients of medals to pay for them; that is, it will make it more pleasant for the jurors who have the task of awarding them. When the fair association pays for them the jurors are likely to be embarrassed in the endeavor to please everyone by the fact that they may be taxing the association too heavily, but if those who receive them foot the bills there will be no trouble on this score. It might be better, and save considerable useless work if it were generally understood that every exhibitor could have a medal—gold, silver or bronze, as he was willing to pay for; it is doubtful, however, if, in the way awards at fairs are looked at just now, even this would make much of a boom in the medal business. It is pretty generally believed that a complicated machine cannot be satisfactorily tested and classed by weighing or measuring, as in the instance of a fat hog or a big pumpkin at a country fair.

It has in late years come to be a well-established fact in the economy of railroad management that at about this time of year expenses will be cut down by putting shop men on short time. Already some of the larger roads have begun this retrenchment policy, and the smaller ones may be trusted to follow without delay. It is unfortunate that these reductions in time and pay cover the season of the year when workmen need full wages more than at any other time—when they are really in the nature of a hardship to men who need all they can earn to make their families comfortable. It is, perhaps, not easy to remedy this, since stockholders have come to expect, if not demand, it, but we doubt if it will be found profitable in the end. It is a well-known fact that some of the smaller roads, which never have sufficient force to keep their rolling stock in proper order, in following in the wake of the larger corporations, do not keep it in a fairly safe condition during the short-hour season. With the larger roads this is not so likely to be true, but there is at least one other difficulty in the way of the establishment of this custom: railroad shop men are not, as a rule, paid as high wages as the same kind of mechanics in other shops, and it is a safe prediction that, if short time for half the year is to be the general rule, the best workmen will not be found in railroad shops.

The Science of Invention.

The men who succeed in invention are those who work with the definite object of making something to accomplish an end not before accomplished, or doing it better than it has been done before. The reason why so few succeed is because so few work with these ends in view. Any candid observer in the field of invention is likely to have the fact impressed upon him that nine-tenths of all inventions show pretty conclusively that the object of the inventor was not so much to make something better than has been made as to make something different. Such inventions are not likely to pay. People are, properly enough, wedded to old methods, and will not be divorced from them unless they can be made to see positive advantages in the new ones. Many an inventor, elated by the discovery of a new way of accomplishing an end, apparently never stops to consider if the old method is not, after all, better than the new one. A careful examination of the Patent records will, we think, fully substantiate this statement.

Take steam engines, for example. We find almost innumerable instances of valve motions, the great majority of which are designed to accomplish, in a less efficient manner, ends already accomplished; different ways of doing the same thing, without anything in the way of improvement—sometimes quite the reverse.

In the particular instance of substitutes for the link motion on locomotives, we imagine that inventors have much to learn. Nothing is more common than some device to supersede the link. The link may be superseded; perhaps the valve motion is already devised and in use that is to do this, but the majority of inventions looking to this end show that those who conceived them had but little idea of the link motion. Starting out upon the basis of the common assertion that the link motion is imperfect, the only idea, in most cases, is to make something—anything—that will do away with its use. Why such inventors meet with failures ought to be obvious.

These examples are only cited because they happen to occur. The principle involved—viz., that there is a wide difference between inventing something different and something better—is the same everywhere and with everything. If invention were reduced to a science, there would be some hope that as a preliminary an examination of the advantages to be gained would be thoroughly studied; this would very materially reduce the number of inventions, to the advantage of every one.

Navy Yards and Private Yards.

In visiting navy and private yards, the difference of management strikes the beholder very forcibly. In the navy yard, all hands stand by to let one man have a chance to work. In the private yard, all hands pull together, and the work is done while the navy yard gang is getting ready to take hold.

There is a like difference in every branch of the work. The economy practiced in little things in the navy yard is not worth speaking of. In the private yard we see a man with a bucket, engaged in picking up the rivets dropped by riveters around the hull. We see a man picking good coal from a barrow as the ash and clinkers are shoveled into barrows in the blacksmith shop. We see a man picking up every piece of iron cut off by the various shears; he sorts and places each kind where it will be worked up or sold. These little points show a big difference from the navy yard economy, where everything superfluous is often thrown on one side with "no matter, Government paid for it, they can stand it."

The determination of the steel-rail mills to restrict the output for the coming year has had the effect already to largely increase orders. So long as there was a prospect of production beyond any possible demand railway companies delayed purchases in hopes of lower prices. Since there is no reasonable hope of this they are more willing to buy, under the belief that prices will soon be further advanced, which seems altogether probable.

In Canada the importation of prison-made goods from the United States is prohibited. Several consignments of such goods have been returned. We commend the Canadian Government for their good sense in this matter, and hope they will continue in well-doing.

Literary Notes.

THE PRESERVATION OF TIMBER BY THE USE of Antiseptics. By Samuel Bagster Boulton, Assoc. Inst. C. E. Reprinted from *Van Nostrand's Magazine*, New York: D. Van Nostrand, 23 Murray and 27 Warren streets.

The subject of the preservation of timber and wooden structures from decay has always been an important one. In this book information is given on the cause of decay, and its prevention, that will be appreciated by all interested in the subject. The paper embodied in the work was presented by the author to the Institution of Civil Engineers, and fully discussed, the discussion forming by no means the least valuable part of the work. It is a book of 223 pages, and is sold for 50 cents.

WATER METERS; COMPARATIVE TESTS OF Accuracy, Delivery, etc.; Distinctive Features of the Worthington, Kennedy, Siemens and Hesse Meters. By Ross E. Brown, Mem. Tech. Soc. Reprinted from *Van Nostrand's Magazine*. New York: D. VanNostrand, Publisher, 23 Murray and 27 Warren streets.

The author in this work describes the mechanical construction, and the operation of the meters he discusses, in detail, using the necessary engravings. For this alone the book is worth more than the price for which it sells. The requisites of a good meter are briefly stated, and arguments in favor of the common use of meters in cities are given, followed by the results of the tests of several meters. The book concludes with some translations from a paper contributed to *Le Genie Civil* by M. Andre, mainly descriptive of some forms of meters, also illustrated. The price is 50 cents.

HISTORY AND EARLY REPORTS OF THE MASter Car-Builders' Association, Including the First Six Annual Reports of the Association for the Years 1867, 1868, 1869, 1870, 1871 and 1872.

These early reports of the association have been entirely lacking in available form until now. They are interesting as bringing these reports up to a time when they were regularly printed, and thus showing the progress made during these years.

CHART AND TABLES FOR BEVEL GEARS. A new, simple, and accurate method for finding the angles and diameters of any pair of bevel gears by calculations, and without drafting instruments or special tools. By George B. Grant, Mechanical Engineer, 66 Beverly street, Boston, Mass. Price, 50 cents.

The author has supplied in this a little work that ought to be appreciated. By giving a little time to the study of his methods, any mechanic should be able to turn a pair of bevel gears correctly, something that is not often done, except in shops where large numbers of them are made. Those who are not willing to give the time necessary to comprehend the subject should not buy the book.

From all accounts the compound locomotives on trial in England, are, as we have previously intimated, not proving successful. It appears that they use quite as much fuel as the ordinary locomotive, and are not adapted for high speed. It is not right, however, to condemn them on first trial. In such a departure mistakes are likely to be made which experience will remedy.

The Philadelphia Traction Company, declared a dividend of 1½ per cent. on August 25th, and on September 1st they called an assessment of $5 per share. The dividend sounds well, and no one ought to notice the assessment.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(275) **E. U., Reading, Pa., will find rule** for calculating compound-gearing for screw-cutting in the American Machinist of Oct. 20, 1881.

(276) **T. G., Newark, N. J., asks:** How can I find the exact horse-power of an engine built by the Delamater Iron Works in 1862? *A.*—By loading the engine to its capacity, and then determining the power developed by the use of an indicator or a friction-brake. An engineer used to engine construction could, by an examination of the engine, tell you approximately what power it would develop.

(277) **J. M., Philadelphia, Pa., writes:** I am using a 3″ steam pipe, 40 feet long, to an engine 12″×24″. I get low initial pressure in the cylinder. One person tells me if I will put in a throttle-valve one size larger than the pipe I shall get higher initial pressure. The throttle has a direct passage straight through it. What is your opinion? *A.*—Our experience is, that the larger throttle will not increase the initial pressure. We think if you will try the experiment, you will find you can close your present throttle considerably without decreasing the initial.

(278) **J. J. N., Lexington, Mo., writes:** We have a suction pipe 14 inches diameter, 2,500 feet long. The end is three feet under water, and provided with a foot-valve. The lift will be 10 feet. We have two duplex pumps 12″×18″. Will they draw the water through this pipe; and if so, how much? Would it be better to put another check-valve in the suction pipe, about midway of its length? *A.*—There should be no trouble with the pumps drawing water, if the pipe is fairly straight and tight. You ought to get 800 gallons of water per minute, perhaps more. There is no need of the second check-valve. A suction chamber on the pipe at the pumps would be an advantage.

(279) **R. A., Charleston, S. C., writes:** I have been trying to change the speed of an engine with the governor on the shaft. I want the engine to run slower by 35 revolutions, but find, upon letting out the springs, that the governor will not work properly. What is the reason, and how can I remedy the trouble? *A.*—In a governor of this kind, as the weights move out or in, there must be at all positions a certain relation between the tension of the springs and the centrifugal effect of the weights due to the circle in which they revolve. In other words, there must be harmony in this respect. In letting out the springs you have destroyed this harmony. Another reason is, that in slowing down the engine you have made the governor less powerful to do its work. Perhaps, by using heavier weights and different springs you may accomplish your purpose. The proper way to find out what it is best to do is to write to the parties who built the engine.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

J. Clayton, Air Compressors, Rock Drills 43 Dey st, NY

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Presses & Dies, Ferracute Mach. Co, Bridgeton, N.J.

Steel Name Stamps, &c. J.B. Roney, Lynn, Mass.

Curtis Pressure Regulator and St'm Trap, Sep 26, p 13

Tack, wire, and shoe nail machinery; Wm. A. Sweetzer, Brockton, Mass.

Treatise on gear teeth and bevel gears; specimen pp free. Geo B. Grant, 66 Beverly st., Boston, Mass

Consulting Engineer and Mechanical Expert, C. C. Hill, 84 Market st., Chicago, Ill.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts, New York.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John st., N. Y.

Improved Labor-Saving Upright Drills: prices reasonable. Currier & Snyder, Worcester, Mass.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Drop presses, and other special tools, manufactured by Williams, White & Co, Moline, Ill.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Farley's Reference Directory of the Machinists', Iron, Steel and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the Am. Machinist each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N.Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass.

The Cumberland (Me.) Paper Mills (who make 30 tons of paper every day), say the Kellam Pressure Regulators [five in use] attached to their drying machines "Work satisfactorily in all cases." Hine & Robertson, 12 Cortlandt st., N. Y., sole agents.

Locomotive Engine Running and Management. By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

Manufactures

The La Grange, Ga., cotton seed oil mill is being enlarged.

Thos. M. Swift is building a guano factory at Elberton, Ga.

A large paper-pulp mill is to be erected at Paris, Maine.

A paper mill is to be built at Berlin Falls, N. H., by the Glen Manufacturing Co.

The Navy Department has called for bids to finish a new stock of steel projectiles.

The Woodbury Glass Works, South Jersey, N. J., started up Sept. 15.

The Malaga Glass Works, West Jersey, N. J., will start Oct. 1.

The Albany Ice Co., Albany, Ga, are putting in a new 10-ton ice machine.

The Pennsylvania Railroad will build 20 miles of road, from Manahawkin to Barnegat City.

The Northfield Knife Co., Northfield, Conn., are making extensive additions to their works.

The Phillipsburg Stove Works, Phillipsburg, N J., have increased the wages of their employes 10 per cent.

The rolling-mill at Niles, Ohio, known as the Ward Rolling Mill, is to resume operations. This mill has been idle for two years.

Wilson, Walker & Co., Pittsburgh, Pa., are to build considerable addition to their works for the construction of coal cars.

The hollow-ware factory of Boetine, Thomas & Co., Williamstown, N. J., has recently started up after a period of idleness.—*West Jersey Press.*

It is reported that the Bethlehem Iron Company, Bethlehem, Pa., are getting a plant ready for casting cannon.

McCormick & Co., South Harrisburg, Pa., have commenced the erection of a plant for making steel by the Clapp-Griffith process.

Mr. John Bell, Stillarton, N. S., is about starting a machine shop for the manufacture of small machinists' tools and general machine work.

A grain elevator is being built at Washburn, Wis., 108×237 feet, with an extension 56×87 feet; capacity, 800,000 bushels.

Sevill Schofield, Son & Co., manufacturers of worsted goods, Manayunk, Pa., have advanced the wages of their 1,600 employes 5 per cent. The increase was not asked for by the hands.—*Public Ledger.*

J. S. Graham & Co., of Rochester, N. Y., are building a timber surfacing machine, the weight of which will be 9,000 lbs. It is believed to be the largest machine of its kind yet built in this country.

The Columbian Government have been negotiating for the purchase of the yacht 246, owned by Messrs. Cramp, of Philadelphia. If the necessary funds are appropriated by that Government the yacht will be rigged over for a dispatch boat.

It is understood that in the new articles of incorporation of the Standard Window-Glass Works, at Woodbury, Pa., there is an agreement whereby the blowers, if they so desire it, can run the works on the co-operative plan for ten years.—*Phila. Evening Bulletin.*

Peter Ostberg, M. E., of Worcester, Mass., is the representative in this country of "Mitis" wrought-iron castings, some account of which we published in a recent issue. Mr. Ostberg has published in pamphlet form papers and discussions relating to these castings.

The Beckett & McDowell Manufacturing Co., 120 Liberty street, New York, are running their shops at Arlington till ten o'clock at night, with an increased force. They are having a fair demand for steam-engines, and are busy on mining and refrigerating machinery.

Geo. E. Knowles, patternmaker, 69 Beekman st., New York, who started in business last spring, reports that during the last month or so trade has been good, and he is now compelled to turn work out briskly in order to keep up with the demand, and has been compelled to employ extra help. We note that he has put in a Fox trimmer lately.

The Port Washington Manufacturing Company, of Port Washington, Wis., has been incorporated for the purpose of manufacturing sash, doors, blinds, etc.; capital stock, $25,000: incorporators—Herman Goese, Wm. Goese, John Sievers, John M. Schmidt, J. W. Vail, John Schumacher, Peter Johann, E. J. Smith, W. H. Landolt, R. C. Kann, Mathias George and Jacob Lamport.—*Industrial World.*

The citizens in Dover (N. H.), who subscribed for the purchase of lots for the Somersworth Machine Company to build upon, in that city, have met and elected for trustees Mayor Ross, James E. Lothrop, and B. F. Nealley. The trustees will purchase the land and give deeds to the machine company, which will begin the erection of the necessary buildings at once. Three hundred men will be employed when the machine shop starts work.—*Journal of Commerce.*

The Palatka, Fla., *Southern Sun* says that it is now definitely settled that the J. T. & K. W. Railroad shops are to be located at that place, which means an addition of 500 to the population.

The Straight Line Engine Co., Syracuse, N. Y., has printed a list of parties using the "Straight Line," with the size of engine, purpose for which used, and P. O. address of the users. About thirty per cent. of the engines, it appears from the list, are used for electric-lighting purposes. The list shows their engine in use in several foreign countries.

We have been shown by P. C. Holmes, of the firm of P. C. Holmes & Company, Gardiner, Maine, the model of a new water wheel, on which a patent has been allowed, and the manufacture of which will shortly commence at this establishment. The new wheel has many points of marked merit, and is very highly commended by millwrights who have examined it. One of the most notable features is the new application of water, by which additional power is secured. At a recent trial of a wheel made according to the new design, ninety and eight-tenths per cent. of the horse-power was utilized, a truly remarkable record. The new wheel will be known as the "Holmes."—*Industrial Journal.*

W. P. Cramp & Sons, Philadelphia, Pa., are building an iron steamer for H. P. Plant, of New York. This vessel is to run between Tampa, Fla., and Havana. She is to be 200 feet long, 30 feet beam, depth of hold 21 feet. She is to be fitted with triple high-pressure, direct-acting engine, and will carry 150 lbs. of steam. Her cylinders are respectively, 19″, 30″, and 50″ in diameter, by 30″ stroke. She has relief valves upon each cylinder. The three cylinders are to be connected at an angle of 120 degrees. She is fitted with steam reversing-gear, and uses steam wherever possible. She will have tubular boilers of 126 feet grate surface. She is expected to make 14½ knots per hour. Her passenger capacity is 58. This company is also putting new boilers into the steamship Muriel, of the Quebec Steamship Company. The U. S. monitor Terror, which was built by this firm, now lies at their wharf. It is rumored that she is to be completed. We have no positive information concerning her, except that a few men were at work erecting her engines and doing a small amount of piping.

Robert E. Masters writes us as follows: "The Eclipse Wind-Engine Company, of Beloit, Wis., have recently moved their iron-working machinery into their new quarters. A number of cars were run into their old works, the machinery all taken down, loaded, hauled to their new quarters, and put in operation in two days, under the management of Mr. Westaway, foreman of the machine department. Large and commodious brick buildings have been erected for the wood-working department, which will be transferred into the new quarters during the present week. The foundry department will remain at the old works for the present, until new foundry buildings are erected at the new plant. The machine department of the new works and the old foundry, which are a mile apart, have been connected by telephone. The castings will be transferred by rail to the new works. This company have, in the past ten days, shipped a car-load of wind-mills to each of the following places: St. Paul, Minn.; Denver, Col.; Indianapolis, Ind.; Lincoln, Neb., and St. Louis, Mo. They have also shipped one 22½′ pumping-mill, one 18′ x 24′ tank and fixtures, one 75′ tower, one 5″ × 12″ double-acting, brass-lined pump for the water-works at Lyons, Kansas; weight of entire outfit, 50,000 lbs.; one 25′ mill, one 5″×16″ double-acting, brass-lined pump for U. S. Navy Yard, at Portsmouth, N. H.; one 25′ pumping-mill, one 5″×16″ double-acting pump to A. J. Corcoran, 76 Johns street, New York, for country residence; three 16′×24′ tanks for Burlington & Missouri River Railroad, Plattsmouth, Neb.; one 16′×30′ tank for Michigan Central Railroad, at Marshall, Mich.

The various departments of the Pennsylvania Steel works are in full operation during the week, and producing their usual quotas. The Bessemer blooming and rail mills and the merchant mill will shut down next Saturday for repairs. The machine, boiler and smith shops will be kept in operation. The repairs to machinery to be made may take two weeks—possibly less. Work on the new mill is progressing rapidly. The foundations for the engines and other machinery are now being constructed. The Bessemer mill for this year has made more steel than ever before, while the rail and merchant mills have produced more rails than in any previous year. The outlook for a busy fall and winter season is very flattering. The rail mill started on Monday with 56s, sec. 51, and changed on the 2d inst. to 50s, sec. 22. Rolls were again changed yesterday to 60s, sec. 58 on an order for southern shipment. No. 4 hammer was on forgings for shipment all week. No. 3 hammer was on heavy shafting for shipment and for home use. The Bessemer mill was run to its full capacity all week. The open-hearth furnaces are in good condition, and produced beyond their average this week. The foundry was on large castings, a majority of which were steel, this week. A number of cog and gear wheels were also cast for use at the works. The merchant mill is very busy, and has both trains in full operation night and day. During the week they were running 16, 25, and 40-pound rails. The 20-inch train also rolled some angle-bars this week. The frog, switch and interlocking departments have a steady flow of orders, and are shipping every day. While there is no great rush for the products of these departments, business is considered good for this season of the year.—*Steelton Reporter.*

A small strike at the Philadelphia Iron and Steel Works, and a break-down, have stopped a few trains of rolls, but they will start as soon as repairs can be made. This firm report an increased demand for bridge and architectural iron.

A portion of the Reading, Pa., Iron Works, idle more than two years, was started up Sept. 14, giving work to 60 hands. The Keystone Iron Works, of Reading, also idle for a year-and-a-half, are being overhauled preparatory to starting up, furnishing employment to several hundred men.

We have received from Merryweather & Sons, London, a large illustrated catalogue of fire-engines and hydraulic machinery, and fittings made by them. The illustration of machines and appliances is very complete, and the descriptions good. This firm represent a business of 200 years' standing, and do a very complete business in their lines.

Machinists' Supplies and Iron.

NEW YORK, Sept. 17, 1885.

The better feeling in the supply trade and in manufacturing that has been noticeable for the past few weeks continues; but there is nothing like elation or an intention to push matters. Dealers report prices low, and manufacturers that are fairly busy complain that profits are scarcely visible. Still it is conceded that, with a gradual increase in the demand, prices will slowly work upward, and that through a slow process of recovery they will become adjusted. The starting up of idle works must necessarily help sales in supplies and machinery.

Iron—Prices of American iron have not advanced, but there is now little or no inclination of sellers to grant concessions from asking prices. This gives a healthier tone to the markets. There have been several sales in larger lots than has been usual for the past year, and this has reduced the stock materially, and, in some instances, provided for future production. At present furnaces are not disposed to contract for future delivery at present prices. Standard Lehigh brands continue to sell at $17.50 to $18.50 for No. 1 X Foundry; No. 2 X, $16 to $16.50; Grey Forge has sold at furnace for $13.50 to $14.50.

Scotch Pig—The demand for these brands has been a little more active, sales being made of larger lots than for some time previous. We quote Shotts, $19.50 to $20; Coltness, $20; Glengarnock, $18 50 to $19; Gartsherrie, $19 to $19.50; Summerlee, $19 to $19.50; Carnbroe, $18.50 to $19; Eglinton, $17.50 to $18; Langloan, $19.50; Dalmellington, $18.

Lead—The demand is slow, small sales being made at 4.25c. and 4.27½c. Dealers are not disposed to make any reductions in prices.

Copper—We quote Lake 11⅛c. to 11¼c; other brands, 10¾c. to 10¾c. Sales are made at lower figures, and buyers are not disposed to offer bids.

Tin—There has been no business except of a jobbing character, fluctuations in the London market completely unsettling business here. Jobbing lots of Banca are quoted at 20.80c. to 20.90c.; Straits and Malacca, 20.75c. to 20.80c.

Spelter—Refined, 4.75c. to 5c.

Antimony—Hallett's 8 70c.; Cookson's 9.70c.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Mech. draftsman, long experience, wants engagement; good references. Address A., AM. MACHINIST.

Wanted—Position in drawing-room by a first-class draftsman; thoroughly acquainted with locomotive construction; references given. Address Box 10, AM. MACHINIST.

Wanted—By practical mechanic, designer and draftsman, position as supt. or foreman of machine works; have had large experience handling men and systematizing work; best references given; c'rresp'ce solicited. Address Box 486, Waterbury, Ct.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 25 cents per line, each insertion.

The Crescent Steel Tube Scraper is king. Crescent Mfg. Co., Cleveland, Ohio.

Wanted—A new or second-hand horizontal boring and drilling machine. Address V., AM. MACHINIST.

Wanted—A second-hand iron planer, bed and table capacity 4ft.×10ft. Must be cheap. Address Q. D., AM. MACHINIST.

Parties having unpatented inventions wishing to sell, address LEWIS F. BROUS, Patent Solicitor, Frankford, Pa.

To make room for larger tool, will sell cheap, for cash, a planer 42″x42″x12′, in good order. Address P. O. Box 2085, Bridgeport, Conn.

Wanted—Party to manufacture on royalty, Flue Welder; patent applied for. Address G. Buchanan, Box 730, Batavia, N. Y.

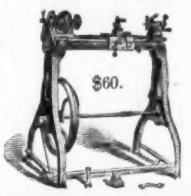
Experimental machinery built; details worked out; shortest notice; reasonable terms. Pennington & Mills, 8 Dey st., Jersey City Heights, N J.

For Sale—28″×16′ engine lathe, 36″ planer, 60″ pulley lathe, 3 small lathes, 28″×24′ shafting lathe, 3 drill presses. A. G. Brooks, 261 N. 3d st., Phila., Pa.

Cheap for Cash.—A 60-inch Newton Half-Automatic Gear Cutter, used one year. Good as new. Also a few other Gear Cutters, Lathes, Planers and Drills. E. Gould & Eberhardt, Newark, N.J.

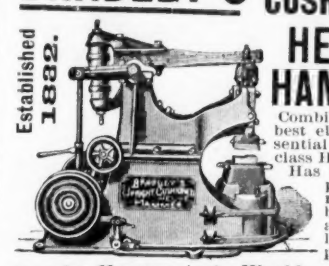
PATENT SOLICITORS | ELLSWORTH & YANTIS, 816 F St., Washington, D.C. Send for Circular.

CHANDLER & FARQUHAR,
177 & 179 Washington St., BOSTON, MASS.



TOOLS AND SUPPLIES
—FOR—
Machinists, Plumbers, Gas Fitters, Electricians, Model Makers, Roller Skate Makers, Amateurs, etc.
Send for Catalogue B.

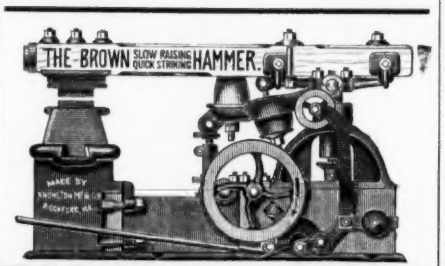
BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER
Established 1832.



Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the **World.**
BRADLEY & CO. Syracuse, N.Y.

STEPHENS PATENT VISES.

50 Per Cent. of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the improved taper, pipe and other attachments. Sold by the trade. Send for circular.
MELVIN STEPHENS, Prop'r, Office, 41 Dey St., New York.



THE BROWN HAMMER
STRIKES A BLOW WITH
DOUBLE THE VELOCITY That it Raises the Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
KNOWLTON MFG. CO., King St., Rockford, Ill

JUST PUBLISHED.
One Volume, Crown, 8vo, 266 pages, 165 illustrations Fine Cloth Binding. $2.50.
MODERN MOULDING & PATTERN-MAKING.
A Practical Treatise upon Pattern-Shop and Foundry Work.
Embracing the Moulding of Pulleys, Spur Gears, Worm Gears, Balance-Wheels, Stationary-Engine and Locomotive Cylinders, Globe Valves, Tool Work, Mining Machinery, Screw Propellers, Pattern-Shop Machinery, and the latest Improvements in English and American Cupolas. Together with a large collection of original and carefully selected Rules and Tables for Every-day Use in the Drawing-office, Pattern-Shop and Foundry.
BY JOSEPH P. MULLIN, M. E.
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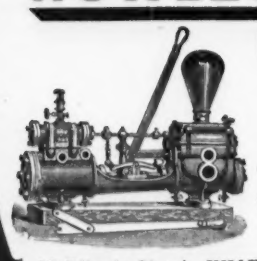

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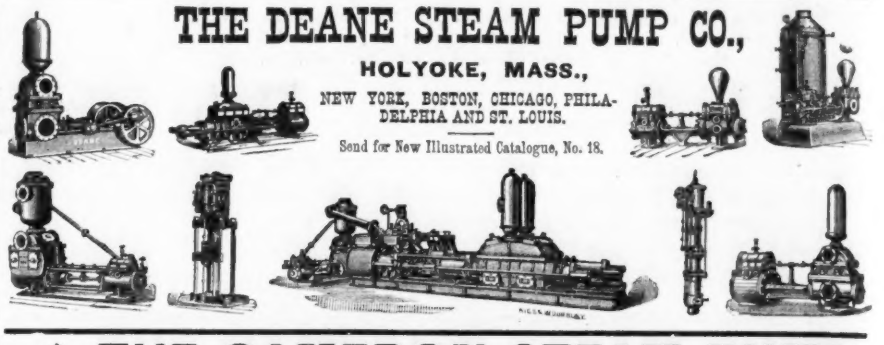

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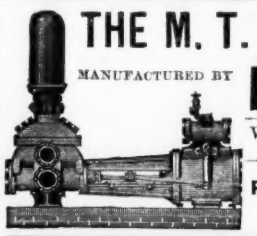

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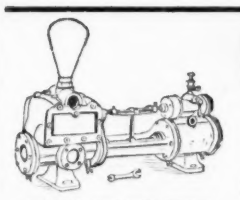

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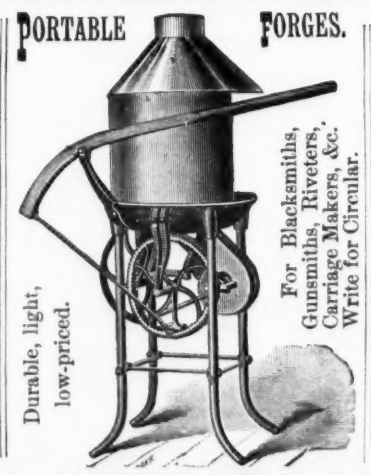

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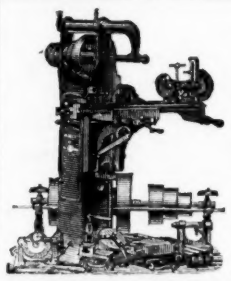

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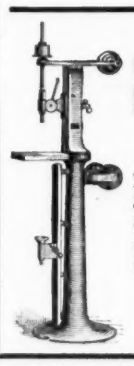

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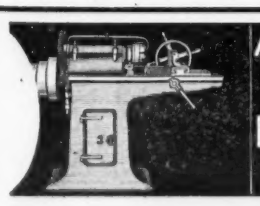

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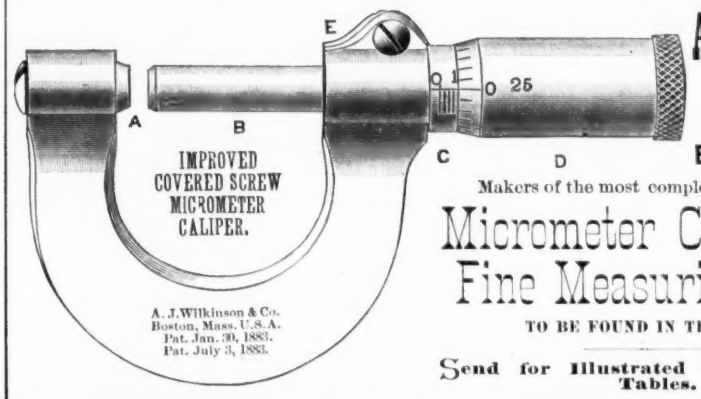

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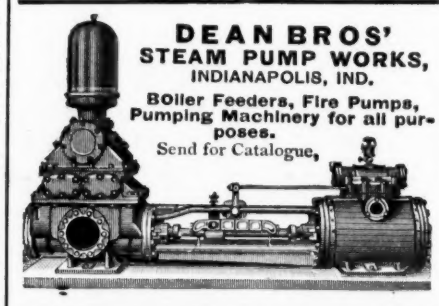

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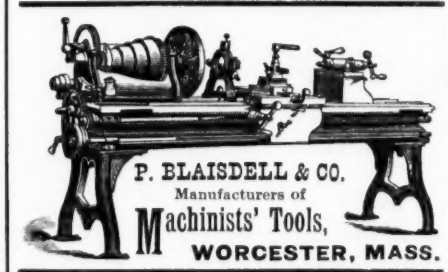

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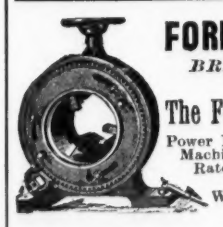

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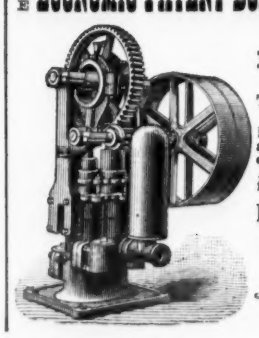

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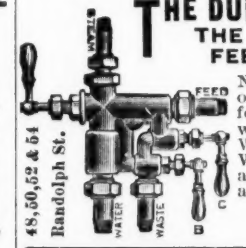

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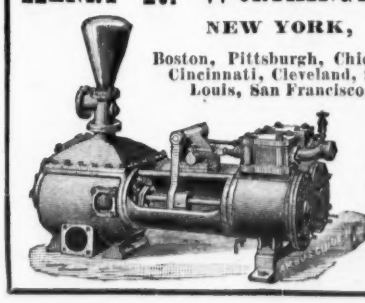

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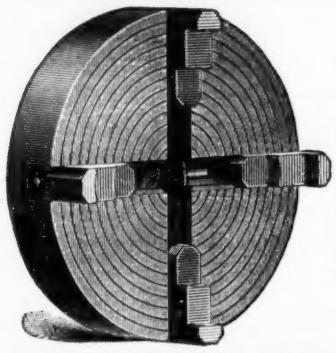

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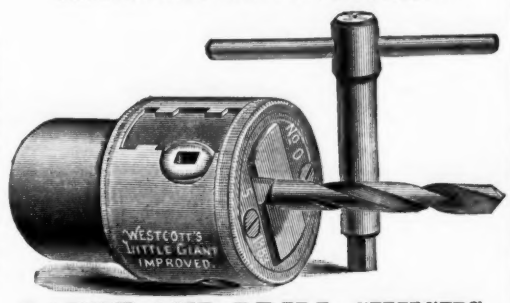

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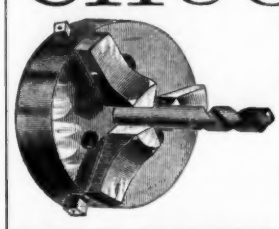

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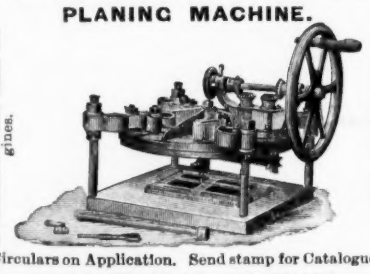

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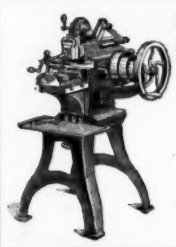

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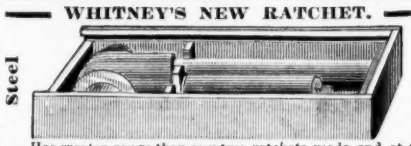

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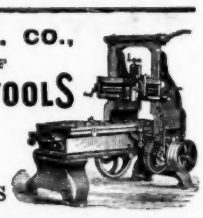

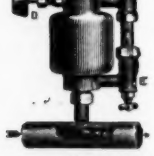

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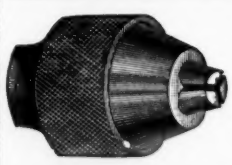

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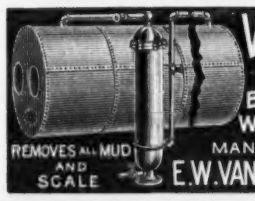

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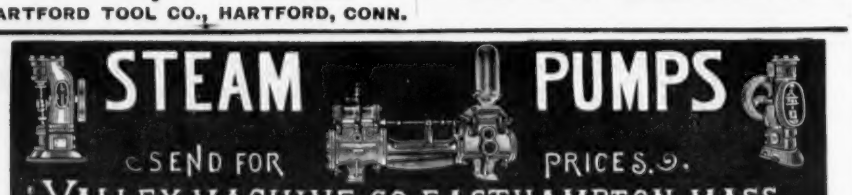

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NOTICE.

Week before last we published, under this heading, references to a small portion of the practical articles that have been specially prepared for the American Machinist, and have appeared in our columns during the last few months. Last week we published an additional list. We append another list below. No other mechanical journal in this country has or ever has had such a collection of practical articles, by writers of well known ability, as are presented in these columns week by week. Every issue gives information that is taken up and applied in the shops and factories in various parts of the country. Copies containing these articles can be readily obtained by ordering of any newsdealer, or by writing to this office, at 5 cents per copy.

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The Development of the Connecting Rod. Sept. 5, 1885.
Balancing Revolving Bodies. March 21, 1885.

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Pitch of Worm Gears. May 23, 1885.

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Oiling Locomotive Valve Motion. May 23, June 27, 1885.

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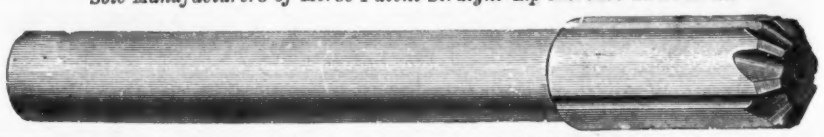

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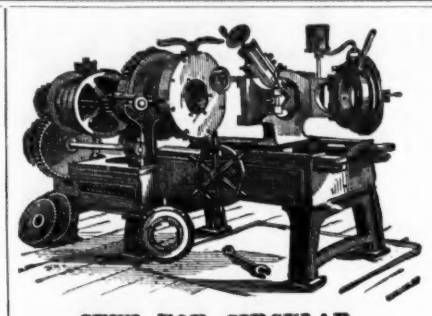

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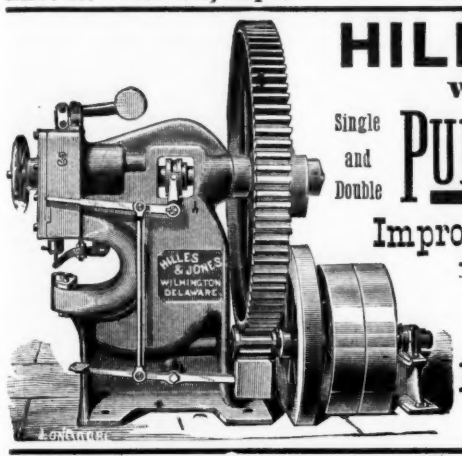

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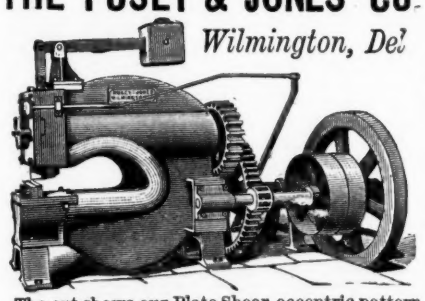

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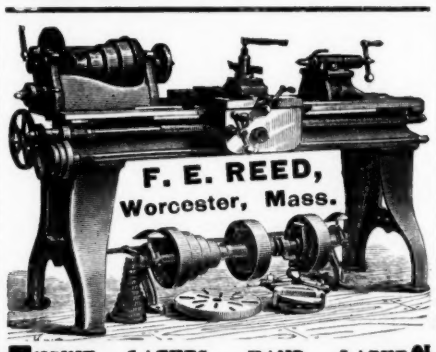

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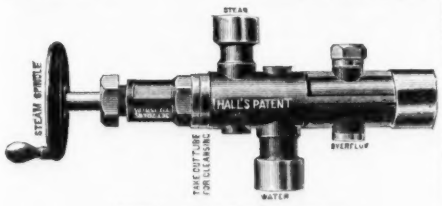

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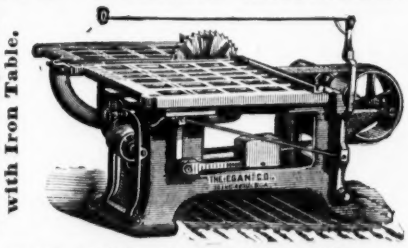

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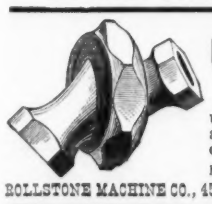

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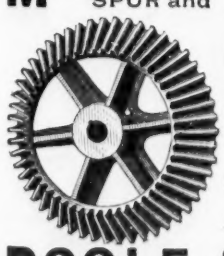

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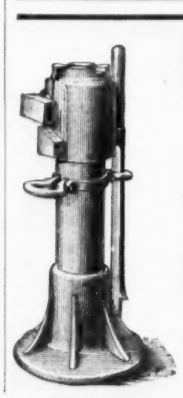

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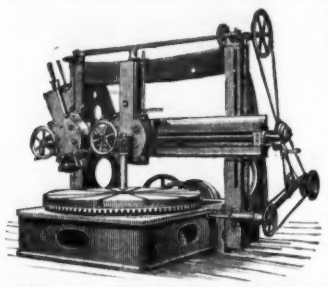

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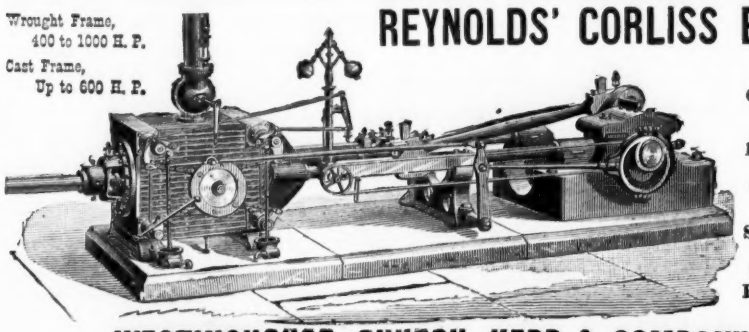

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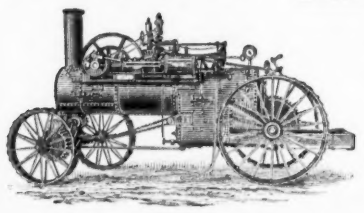

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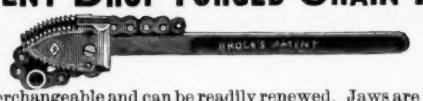

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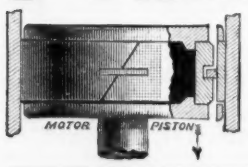

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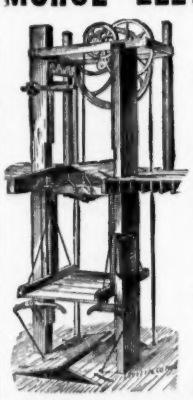

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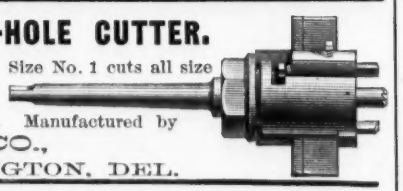

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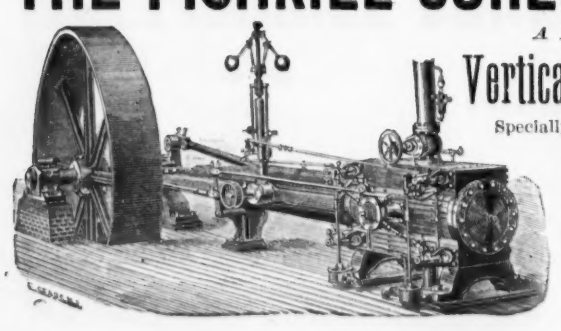

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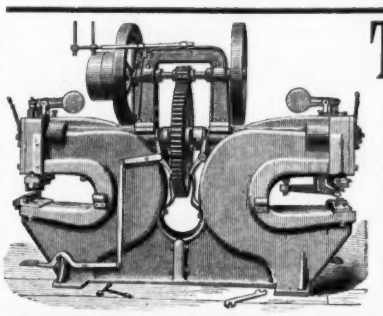

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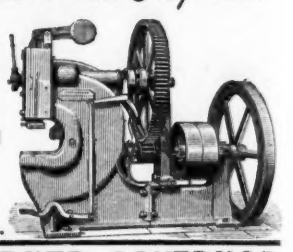

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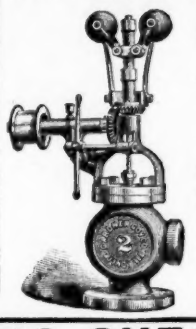

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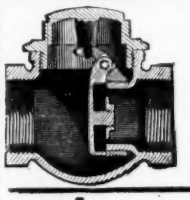

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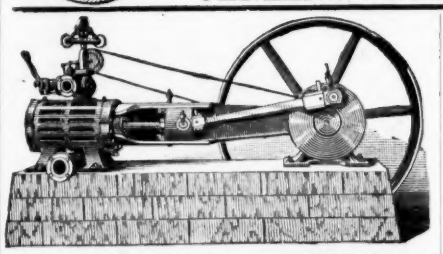

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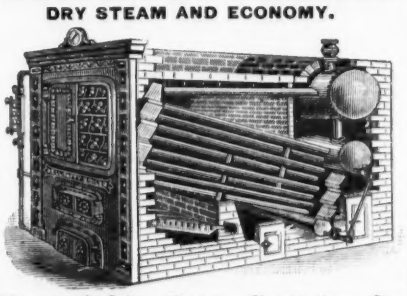

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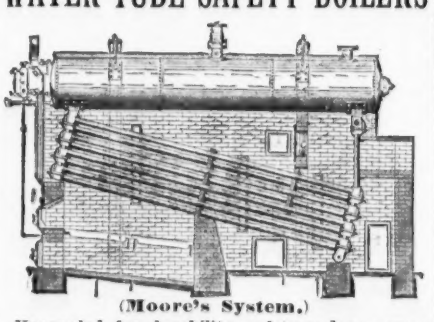

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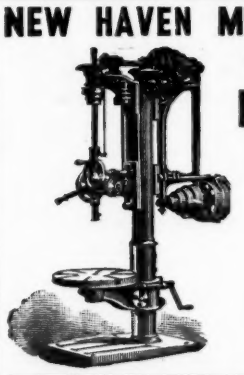

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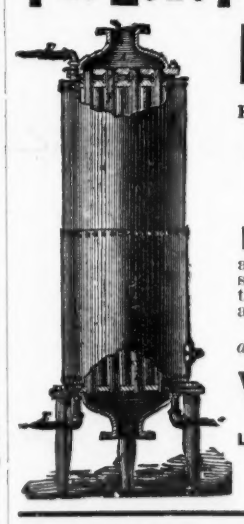

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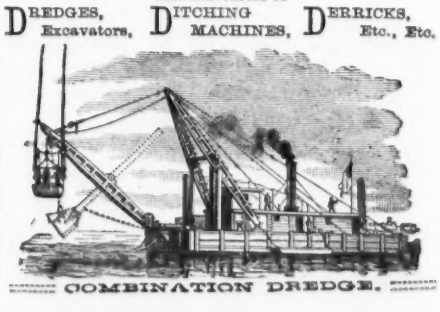

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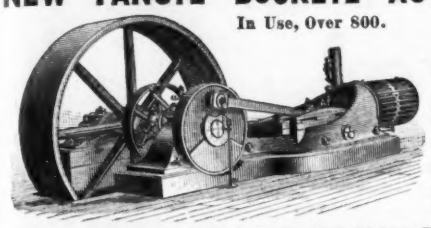

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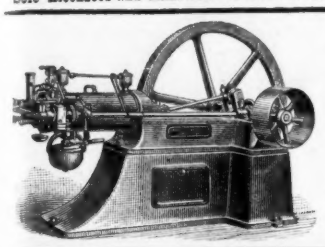

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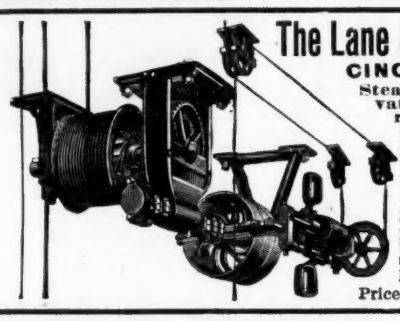

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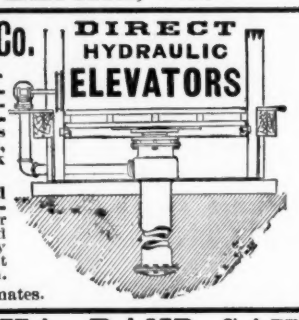

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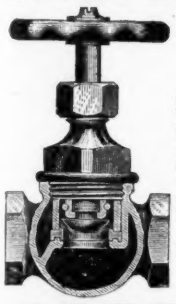

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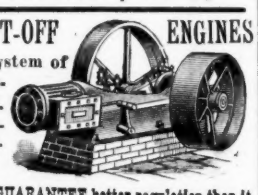

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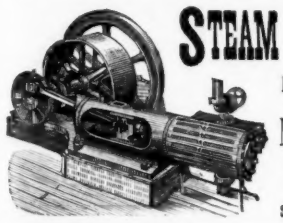

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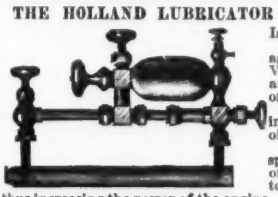

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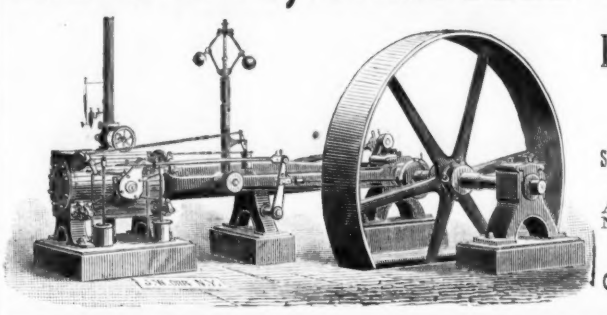

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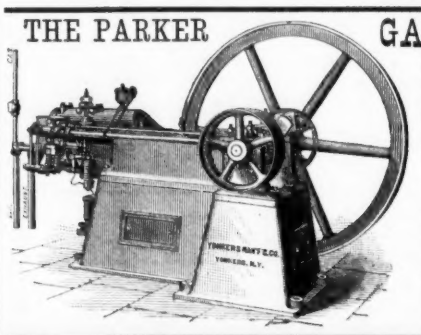

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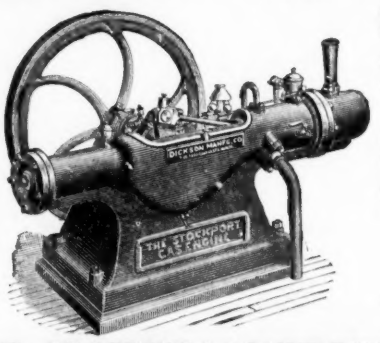

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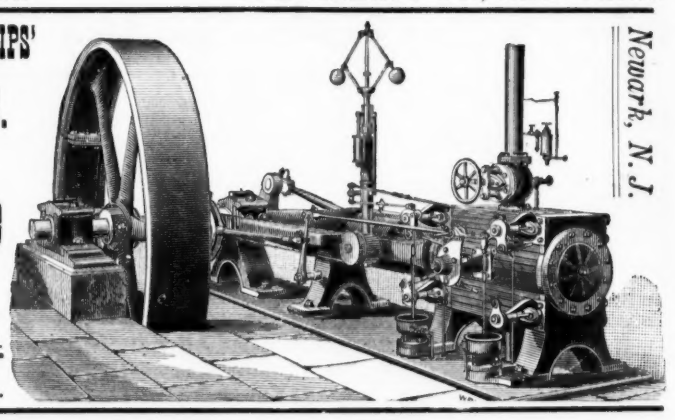

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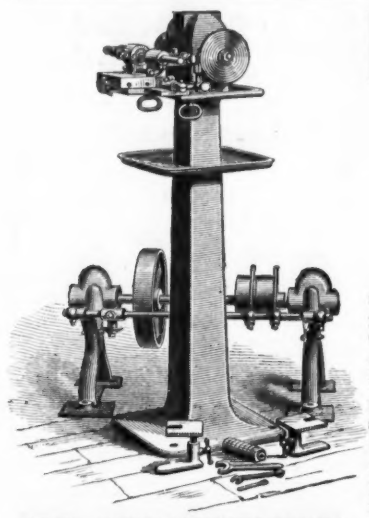

TOOL GRINDING MACHINE,
With Cutter Sharpening Attachment.

BROWN & SHARPE MFG. CO.

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MANUFACTURERS OF

MACHINERY AND TOOLS.

This Machine is the same as one we build, with Cutter Sharpening Attachment in addition. This attachment is for use on straight, spiral or cotter mills, and angular cutters. The straight or spiral mills are held upon a sleeve and moved past the wheel, the tooth being guided by a rest set to give the proper clearance. The bevel cutters are held upon a piece adjustable to any angle, being guided by tooth rest as on the straight or spiral mills. Cutters up to 4 inches long and 5 inches in diameter can be ground. The attachment can be instantly attached or detached. Wrenches accompany the apparatus. Weight of Machine, prepared for shipment, 300 lbs.

Price, with everything shown in cut, $125.

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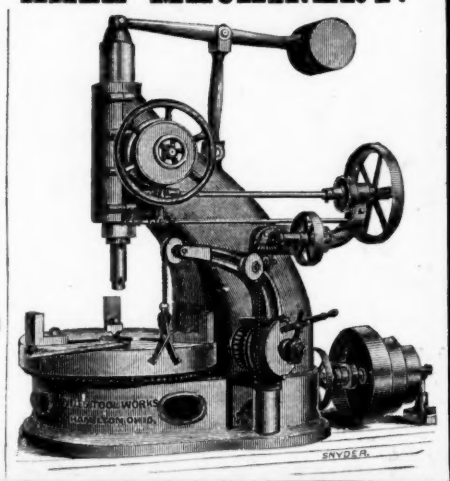

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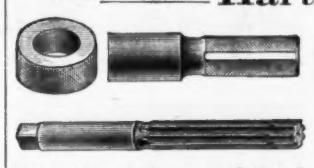

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PRICE LIST and DISCOUNT SHEET furnished on application.

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DROP FORGED OF
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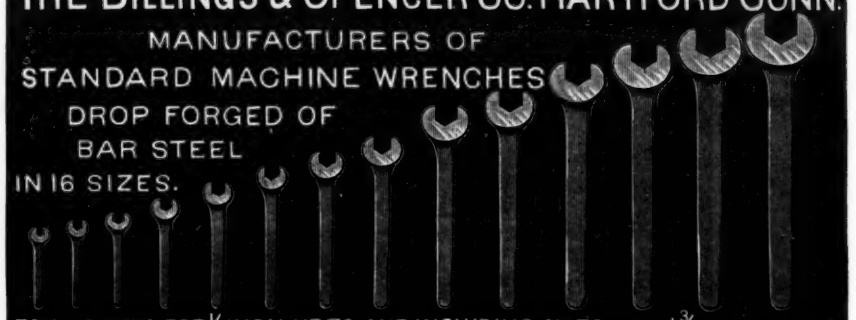

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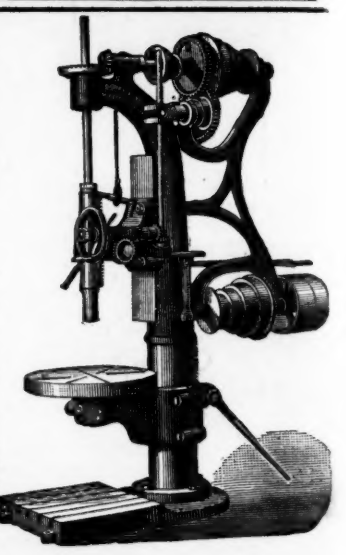

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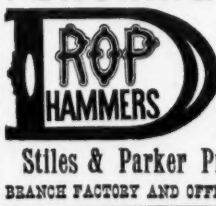

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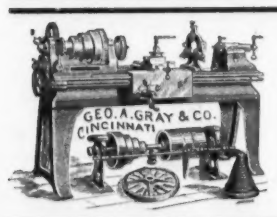

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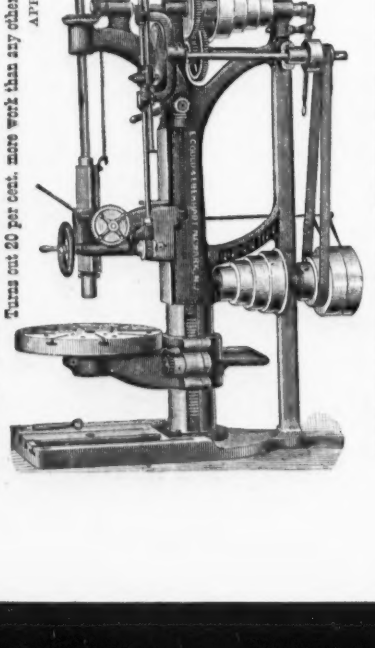

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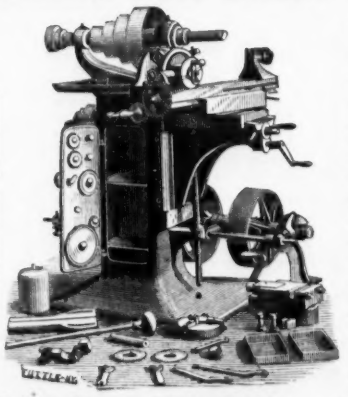

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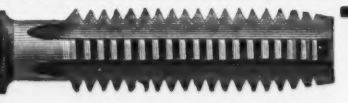

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